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CORRELATION-PERIODOGRAM INVESTIGATION OF RAINFALL ON THE WESTERN COAST OF THE UNITED STATES

By ERVIN J. PROUSE[1]

There have been literally thousands of attempts to find cycles in meteorological phenomena, especially in rainfall and temperature. Among these is that of Alter, published in 1922, in which he demonstrated for rainfall the existence of a cycle of length equal to one-ninth that of the sun-spot cycle. In this work he examined data from each continent of the world and used the phase of the sun-spot variation, instead of the time, as independent variable.

In this work Alter examined exclusively the evidence regarding a definite cycle (namely, one-ninth that of sun-spots) and was not using the periodogram in a search for any other cycles which might exist. He has suggested to the writer that a search of Pacific coast rainfall be made by means of the correlation periodogram, to find whether additional periodicities or cycles exist. Incidentally, the Pacific coast data which he had used were from Oregon and California exclusively and, in the light of the present work, were dominated by the latter.

The data examined in this study are from all stations of long rainfall records in western parts of Washington, Oregon, and California. The data for the stations in California all extend from 1877 or earlier. For Washington and Oregon the corresponding date was 1879. In all cases the data extend to 1930.

Data of each of the stations were summed over thirds of a year as follows: January through April, May through August, and September through December. This division into thirds of a year was made so that the May to August 4 months' period of California data could be omitted. The rainfall in California for these months is very small and the resulting percentages of normal would be so variable that accidental variations might dominate the periodogram. The same method of division as for California was followed for Washington and Oregon. In the case of the Washington and Oregon data, this summer period was used.

To facilitate an analysis of data, it was desirable to determine over how large an area data could profitably be combined. Assuming that stations close together geographically would have high enough correlations to be represented together, a study was made of the correlations between the rainfall averages, by 4-month periods, for a number of local groupings of the stations; and as a result, the data were arranged in two groups for the periodogram calculation, as follows. Apparently, independent conditions are operating in these two adjoining sections of the Pacific Coast region:

Group I contains the following stations in Washington and Oregon:

WASHINGTON	OREGON—continued
North Head	Astoria
Port Townsend	Portland
Vancouver	Roseburg
	Cascade Locks
OREGON	The Dalles
Ashland	Yreka, Calif.
Albany	

Group II contains the following stations in California:

Salinas	Ventura
Stockton	Santa Barbara
Merced	Newhall
Santa Cruz	Tustin
Hollister	San Luis Obispo
San Jose	San Bernardino
Healdsburg	San Diego
Monterey	Los Angeles
Oakdale	

The combined percentages of normal rainfall for each of the two groups are given as table 1. The division of the data into thirds of a year was retained, and the percentage of normal for each of these thirds given with the exception of the middle third of each year for the California data.

The data of table 1 were analyzed by the correlation periodogram method. This method has been exhibited in a number of calculations by Alter and others. The graphical representation of the periodogram from California follows as figure 1 and of Washington-Oregon as figure 2.

In the case of the periodogram of California only 33 values were computed, since by omitting the middle period of 4 months the number of possible pairs of products was cut in half and consequently the number of values that it is desirable to compute was limited proportionally.

We find in studying the periodogram of California that the largest positive ratio of the 33 values was only 1.31, and that including negative values there were only six greater than 1. It would not be at all surprising to find, using random data, a chance value as large as the

[1] Thesis submitted to the University of Kansas in partial fulfillment of the requirements for the degree of Master of Arts, May 1933.

greatest of these. For this reason, it would be entirely unsafe to draw any positive conclusions from the periodogram. We might suggest that a satisfactory analysis of the rainfall of California by methods similar to the above must wait until more data can be accumulated. However, for the Washington-Oregon group, where there is sufficient rainfall to use the middle third of the year, we have approximately 50 percent more products and can make a more critical examination.

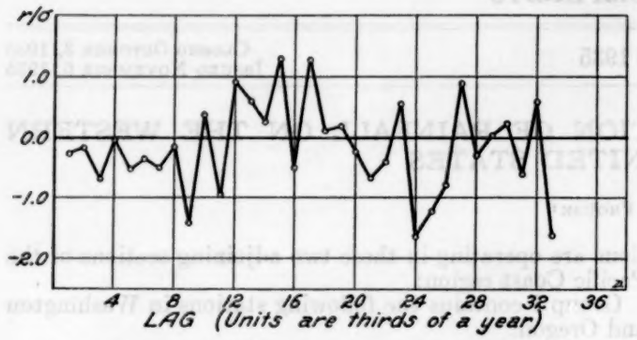

FIGURE 1.—Correlation periodogram of California rainfall.

We find among the 76 ratios in the periodogram of this group four positive values larger than 2, i. e., 2.48, 2.50, 2.19, 2.30, and one negative value greater than minus 2, i. e., −2.52. There are 15 positive values greater than 1, and 14 negative values greater than minus 1. This differs widely from the distribution we would expect by accident. We would expect only 1 positive value out of 70 to be as large as the smallest of the 4, and only 1 out of every 156 to be as large as the largest. We can be quite confident, therefore, because of the multiplicity of large values, that something nonaccidental is indicated in the sequence of rainfall values.

Even more striking than this is the fact that peaks follow each other at quite regular intervals. In a correlation periodogram any periodicity of length l that exists continuously throughout the data used will be manifested in the periodogram by peaks at l, $2l$, $3l$, etc.

A cosine curve of period equal to 4.2 datum intervals and with a phase of zero degrees at lag zero was superimposed on the graphical representation of the periodogram. This period was chosen merely as the best to emphasize the regular recurrence of peaks. The resemblance of the two curves as shown in figure 2 is very striking to the eye. The correlation between the periodogram and the cosine curve was computed and a value of $r=+0.44$ secured. For the range of the data, 76 values omitting lag 0, a sine curve would reach its maximum positive value 18 times. For all of the 18 maxima of the sine curve there was a periodogram peak within one datum interval on each side. On the other hand, only two positive peaks appeared in the periodogram which were not called for by the cosine curve, i. e., by the cycle of 1.4 years. In the case of the minimum values of the cosine curve we find agreement within one datum interval on each side in 16 out of 18 cases, and peaks appearing in the periodogram in but two cases where depressions were called for.

Inspection shows also in the periodogram a much longer swing of the values through a period of approximately 51 datum intervals. Twelve times the 4.2, which we have already considered, is 50.4 of such intervals. A least squares solution was made to find the two cosine terms of lengths 4.2 and 50.4 with phase zero at lag zero that will represent best the periodogram. The results are shown as figure 3. The amplitudes are $r=0.0685$ for the 4.2 and $r=0.626$ for the 50.4. The correlation between the sum of these terms and the original periodogram is $r=+0.612$ and $r/\sigma_r=+5.30$. Only 1 out of 30 million choices should have such a high ratio by accident. Since we have been limited to comparatively few choices there is no question that the pattern of the periodogram is nonaccidental. We have, therefore, a second independent criterion indicating a nonaccidental character for the results obtained.

Alter in working with rainfall data over many areas of the world, showed that a period related to the sunspot

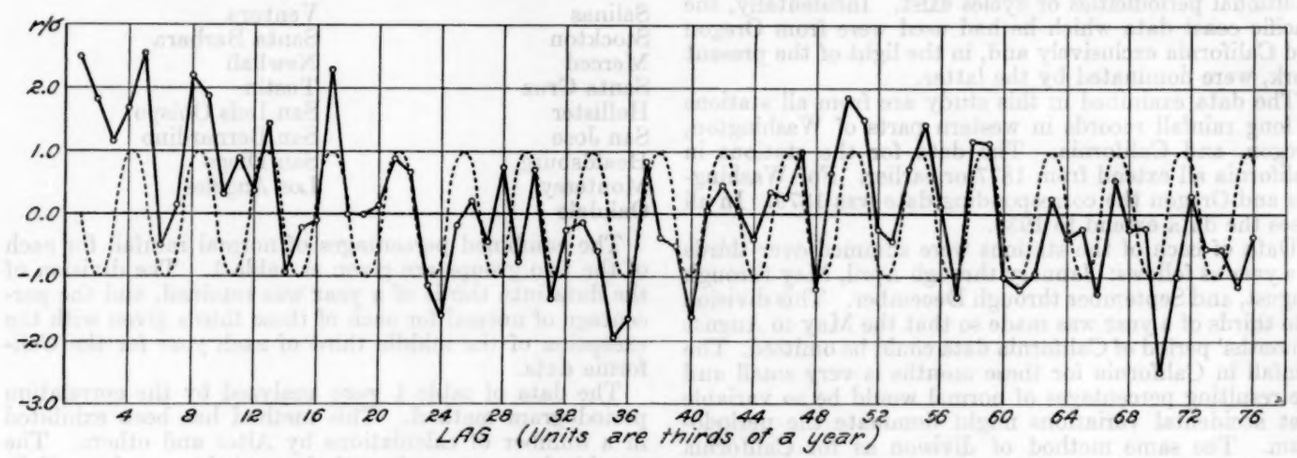

FIGURE 2.—Correlation periodogram of Oregon-Washington rainfall, with a 16.8-month sine curve superposed.

period and equal in length to one-ninth of that period existed. The cycle found in this work, 16.8 months, is almost exactly one-eighth the sunspot period. This is rather surprising since in Alter's data, which were dominated by California, the ninth harmonic showed as strongly as he found it any place in the world.

In order to check further the reality of the eighth harmonic, tables were formed from the first and second halves of the data using monthly values instead of the data as given in table 1.

The cycle exhibited is 16.8 months in length, therefore the first 17 values were written in a row; the next 17 in a row immediately under these, etc., so that the 1st, 18th, 35th, etc., were in a column, the 2d, 19th, 36th, etc., in a

second column, and so on for 17 columns. Since the period is not exactly equal to 17 months there is a slowly increasing error in the positions of the data in the table. This is rectified by repeating the datum at the end of every fifth row.

In such tables the cycle investigated is not averaged out of column means, but all other variations are thus canceled more and more completely as the number of rows increases. The cycle will therefore stand out more prominently in the table means than in the individual data. The means of the tables from the halves of the data may be compared to learn whether they correlate in shape, amplitude of variation and phase. The resulting correlation between the two halves was $r=+0.33$, a value less than was expected from the appearance of the periodogram.

If we assume that this 16.8 month cycle is actually the eighth harmonic of the sunspot cycle, we will expect it to show the same sort of phenomena that Alter found for the ninth harmonic, that is, we should expect the halves to correlate better if we should follow his scheme and use sunspot phase instead of time as the independent variable. The method followed in making the adjustment was published in a paper that is not generally available.

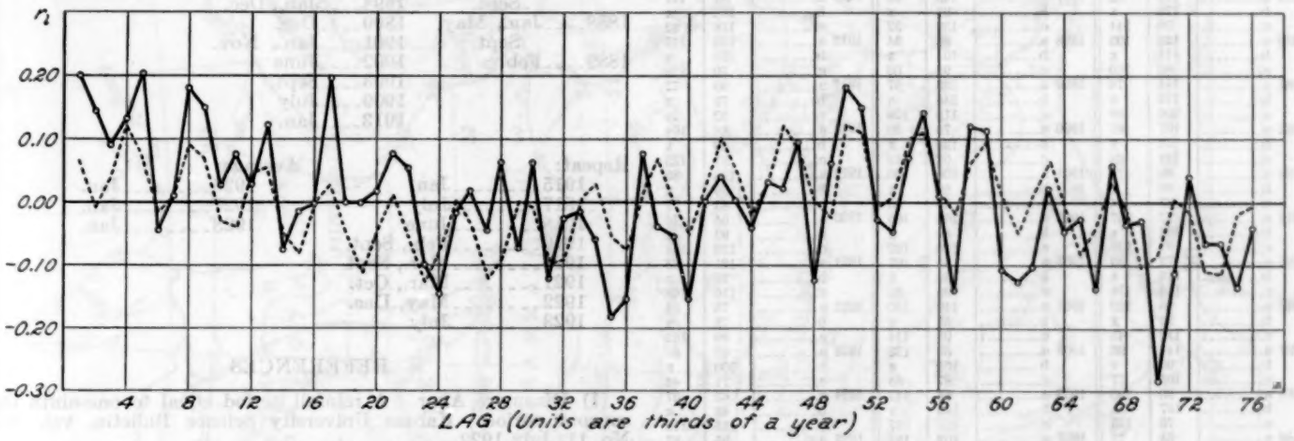

FIGURE 3.—Correlation periodogram of Oregon-Washington rainfall with combined 1.40- and 16.80-year sine curves superposed.

It is, therefore, thought best to quote it here. Tables and figures mentioned are of his paper (1). He says:

Let us consider the following problem; minima occurred in 1889, August, and in 1901, September. The next minimum occurred in 1913, May. It is evident that the sunspot period between the minima named above had values of 145 and 141 months, respectively. Let us examine the two maxima occurring between these dates. One occurred in 1894, February, and the other in 1906, May, with an interval of 147 months. This must have been the average value of the sunspot period between these dates. It is longer than the period obtained from either pair of minima named above, yet it occurs as part of each of them and contains no part that is not in one or the other of them. We are forced, therefore, to the conclusion that if continuous—

The length of the sunspot period is continuously varying and a value of the period obtained between successive maxima or successive minima is merely an average of all values passed through in this interval.

If we had a curve with time plotted along the axis of abscissae and the corresponding values of the sunspot period as ordinates, the average value of the sunspot period between 2 maxima or 2 minima occurring at t_1 and t_2 would be given by—

$$t_1-t_2 \text{ Average value } \int_{t_1}^{t_2} \frac{curve}{t_1-t_2}$$

If we plotted abscissae and ordinates on the same scale, these average values would form squares bounded by ordinates through the dates which limit them. The area between the axis of abscissae and the unknown curve, described above representing the actual value of the period at all times, would in the interval between two maxima or two minima necessarily equal the corresponding known square. Since these squares overlap, we know the value of a series of overlapping definite integrals of the unknown curve. From these data it is possible, assuming the simplest curve to be the true one, by the aid of a planimeter, to construct the curve without knowledge of its mathematical form. In doing this it is easier to choose some convenient period as the axis of abscissae and to measure departures from this period. Changing the axis in this way merely changes all the integrals by a known constant amount and changes the known squares into known rectangles. It is also practical to magnify the scale or ordinates very much over the scale of abscissae. Locating the curve consists first in measuring the area of each of the rectangles, then penciling in what appears to be the curve, measuring the definite integrals of the approximate curve with the planimeter, erasing for a new approximation, and repeating many times. In the curve of the sun-spot values reproduced as figure 1, I have erased each part of the curve probably a hundred times. Although very laborious, the process, with enough patience, yields very good results. The accuracy of the period curve depends upon the accuracy with which the epochs of maxima and minima are obtained. A steep but narrow peak, such as that of 1861, may be unreal for this reason. However, due to the short duration of such a peak and the fact that it must almost immediately be counterbalanced, it will usually have little effect in an examination of data extending over many years.

In the preceding paragraph I have spoken of the sun-spot period at any date as a varying quantity, not even approximately constant through a single cycle. This may necessitate a definition of "period" somewhat different from what is ordinarily understood. I therefore give the following definition which will be adhered to whether referring to sun-spots or rainfall.

The length of the period at any date is the reciprocal of the rate of change of phase at that date and need not continue even approximately through a complete cycle.

From this curve I have taken the mean value of the sun-spot period for each year. These values are given as column 2 of table 2. Column 3 gives the departure from 15 months of one-ninth these values. Obviously, 15 months was chosen because it is the nearest integral number of months to one-ninth of a period. If, for example, the number given for any year in column 3 were plus nine, it would mean that during that year one-ninth of the sun-spot period was 16 months. If it were minus nine, it would mean that the period was 14 months. In the first case it would be necessary, working on a 15-month basis, to skip a month every 16 months as long as that length of period persisted, in the second case to repeat 1 every 14 months. We can thus construct a table of months to be repeated in the analysis of our rainfall data when the ninth of the sun-spot period is less than 15 months, or to be skipped (or better still, averaged with the next adjacent one) when the ninth is more than 15, in order that Wolfer's sun-spot maxima may all fall in one phase and his sun-spot minima in one.

Alter's table of months to be averaged or repeated in order to make this adjustment is reproduced as table 2 with additional months added to bring it up to date.

The correlation computed after adjustment was made was $r=+0.46$. This is much higher than the $+0.33$ correlation of the chronological data, confirming the evidence not only as to the reality of this cycle, but that it is actually related to the sun-spot cycle and equal to one-eighth of that cycle.

The writer examined Alter's California and Oregon data for the eighth harmonic and found a small correlation of $+0.178$ between the halves of the data. This appears probably due only to the few Oregon stations included among the California ones. He also examined the above data of Oregon and Washington for the ninth harmonic and found the negligible correlation of $+0.036$. There seems to exist very definitely in Washington and Oregon a different cycle from that which exists just as definitely in California and in many other parts of the world.

TABLE 1

Group	I	II	Group	I	II	Group	I	II
1877 a	------	54	1895 a	89	116	1913 a	81	77
b	------	x	b	147	x	b	141	x
c	------	77	c	119	56	c	90	140
1878 a	------	186	1896 a	151	101	1914 a	120	149
b	------	x	b	149	x	b	71	x
c	------	56	c	182	39	c	87	103
1879 a	120	92	1897 a	145	98	1915 a	81	141
b	179	x	b	91	x	b	103	x
c	96	144	c	130	52	c	118	82
1880 a	123	103	1898 a	86	34	1916 a	132	147
b	115	x	b	104	x	b	131	x
c	80	160	c	93	60	c	70	129
1881 a	144	74	1899 a	123	87	1917 a	90	72
b	122	x	b	146	x	b	73	x
c	105	66	c	118	128	c	92	24
1882 a	107	87	1900 a	74	50	1918 a	88	104
b	75	x	b	133	x	b	69	x
c	123	63	c	93	119	c	81	123
1883 a	99	71	1901 a	100	100	1919 a	128	85
b	46	x	b	68	x	b	59	x
c	87	64	c	69	65	c	83	77
1884 a	77	207	1902 a	105	105	1920 a	65	75
b	104	x	b	84	x	b	93	x
c	92	120	c	120	102	c	130	144
1885 a	72	39	1903 a	84	107	1921 a	121	83
b	110	x	b	98	x	b	78	x
c	114	176	c	96	59	c	110	168
1886 a	95	120	1904 a	140	110	1922 a	78	54
b	95	x	b	51	x	b	78	x
c	110	45	c	95	114	c	89	162
1887 a	144	96	1905 a	69	132	1923 a	82	61
b	93	x	b	104	x	b	100	x
c	105	77	c	87	58	c	71	46
1888 a	90	100	1906 a	84	143	1924 a	63	57
b	157	x	b	116	x	b	46	x
c	76	153	c	121	137	c	115	110
1889 a	64	76	1907 a	102	151	1925 a	95	87
b	104	x	b	87	x	b	76	x
c	92	341	c	101	88	c	77	64
1890 a	135	114	1908 a	84	83	1926 a	73	157
b	97	x	b	116	x	b	113	x
c	51	65	c	70	72	c	114	136
1891 a	96	99	1909 a	106	177	1927 a	105	124
b	127	x	b	84	x	b	82	x
c	140	82	c	115	166	c	106	138
1892 a	77	72	1910 a	106	64	1928 a	97	67
b	99	x	b	76	x	b	40	x
c	115	160	c	107	42	c	87	112
1893 a	118	124	1911 a	74	171	1929 a	66	60
b	112	x	b	102	x	b	71	x
c	134	79	c	84	49	c	57	8
1894 a	147	62	1912 a	101	86	1930 a	------	------
b	106	x	b	174	45			
c	104	158	c	100	45			

TABLE 2.—*Data repeated or averaged in keeping rainfall periodicity in step with sun spots*

Averaged	Repeated	Averaged
1861—Mar., Sept.	1865—July	1872—April
1862—June	1866—July	1873—Sept.
1863—June	1867—Mar., June, Sept., Dec.	1874—April, Sept.
	1868—Jan., Apr., June, Aug., Nov.	1875—Mar., June, Nov.
	1869—Feb., June, Oct.	1876—Feb., May, Aug., Nov.
	1870—April, Oct.	1877—Jan., Apr., July, Sept., Dec.
	1871—April	1878—Mar., June, Aug., Nov.
		1879—Mar., July, Nov.
		1880—Apr., Oct.
		1881—July
		1883—Mar.

Repeated	Averaged	Repeated
1884—Jan., Sept.	1891—Jan.	1915—Jan.
1885—April, Oct.	1894—May	1917—July.
1886—Jan., May, Sept.	1895—Jan., Sept.	
1887—Jan., May, Sept.	1896—April	
1888—Jan., May, Sept.	1897—Mar.	
1889—Feb.	1898—Jan., Dec.	
	1899—Dec.	
	1901—Jan., Nov.	
	1902—June	
	1903—Sept.	
	1909—July	
	1913—Jan.	

Repeat:		Average:	
1915	Jan.	1926	Jan.
1917	July	1927	Jan.
1918	June	1928	Jan.
1919	Feb., Sept.		
1920	Mar., Sept.		
1921	Mar., Oct.		
1922	May, Dec.		
1923	July		

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(1) Dinsmore Alter. A rainfall period equal to one-ninth the sunspot period. Kansas University Science Bulletin, vol. xiii, No. 11, July 1922.

(2) G. Udney Yule. Presidential address, Sec. V. Jour. Roy. Stat. Soc., January 1926.

(3) Dinsmore Alter. A group or correlation periodogram. MONTHLY WEATHER REVIEW, June 1927.

RELATION OF THE EXTREMES OF NORMAL DAILY TEMPERATURE TO THE SOLSTICES

By Edward H. Bowie

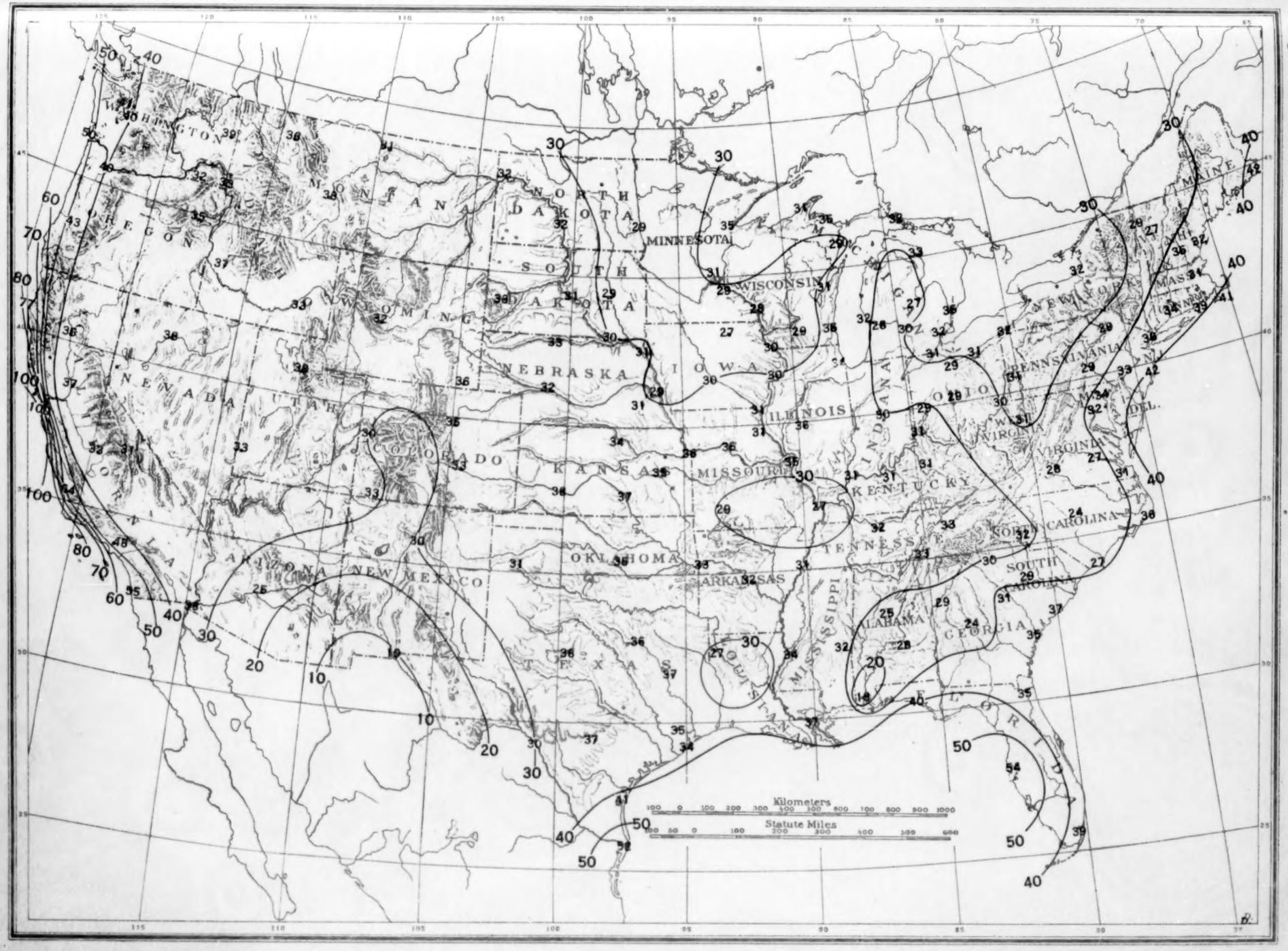
[Weather Bureau, San Francisco, Calif., August 1935]

A true normal daily temperature is defined as one that has been computed from a long series of values of hourly temperatures for each day, derived from automatically-recording thermometers.[1] There are numerous records of this character that cover periods of upwards of 20 years at many Weather Bureau stations; but these, according to Marvin and Day, are insufficient in number adequately to represent the details of the climatic conditions over an area the size of the United States.

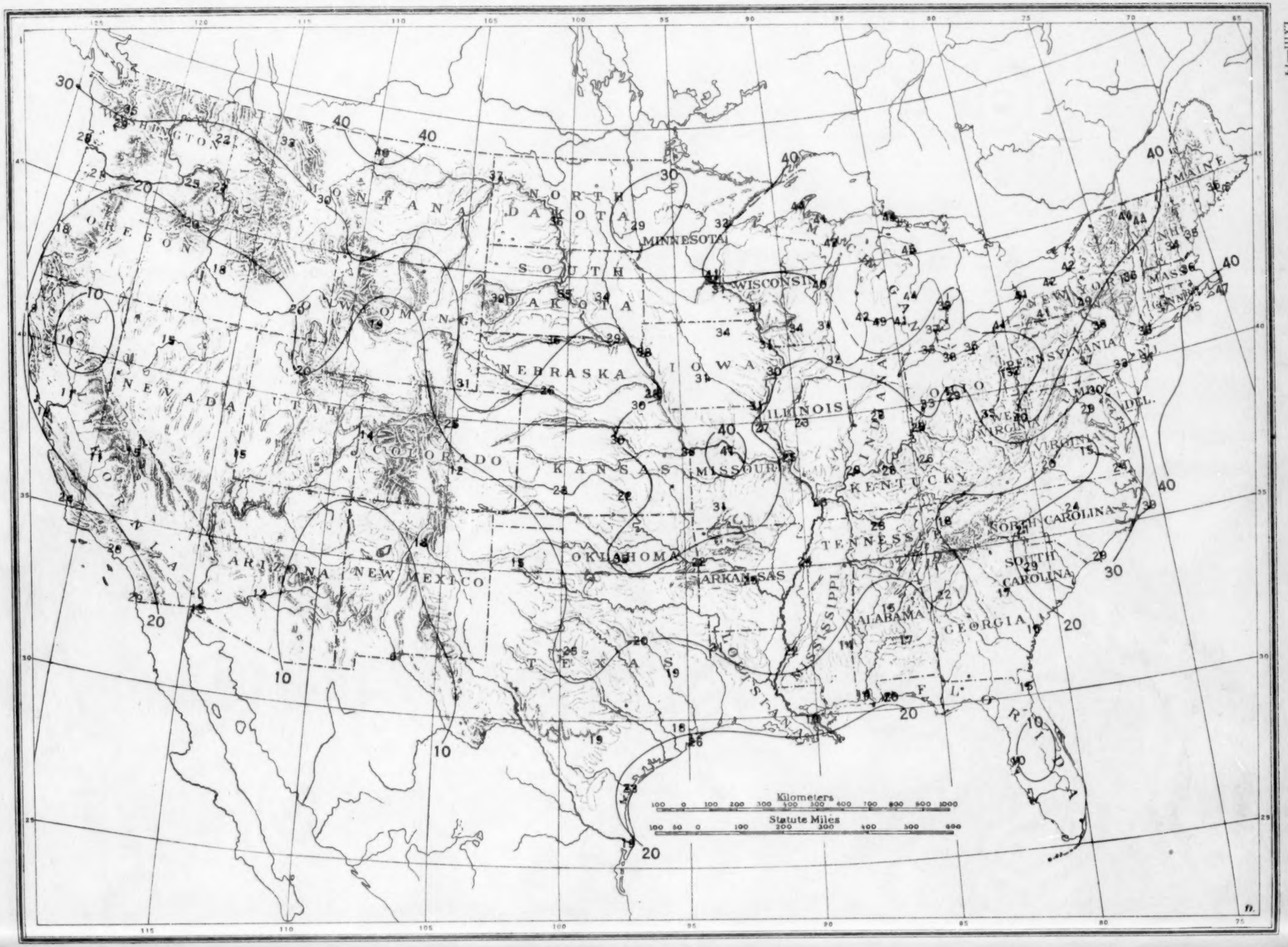
Moreover, the labor of computing normals from hourly readings is too great to justify their general preparation. In lieu thereof, normal daily temperatures, based on the maxima and minima of temperature, have been computed, since they are nearly the same as the normal daily temperatures determined from hourly readings for similar periods of time. Such normals are given in Supplement

[1] MONTHLY WEATHER REVIEW, Supplement No. 25, Normals of Daily Temperature for the United States, by Marvin and Day.

E.H.B. **Fig. 1. Number of Days from Summer Solstice to Highest Normal Daily Temperature**



E.H.B. **Fig. 2. Number of Days from Winter Solstice to Lowest Normal Daily Temperature**



No. 25 of the MONTHLY WEATHER REVIEW for all regular Weather Bureau stations of long or relatively long record. They have been determined to tenths of a degree Fahrenheit for each day in a way that leaves little doubt as to their accuracy.

Since 1922 these daily normals have been in official use at all Weather Bureau stations. From them the departures from the current mean daily temperatures are ascertained and made a part of the local climatological record. Should anyone desire to know the precise way in which these normals were computed he should consult the official report containing them.

Because the daily normals are given to tenths of a degree Fahrenheit, it is easy to determine quickly the dates of occurrence of the highest and the lowest normal daily temperatures at each of the stations. This has been done by the writer for all stations; and the dates of highest normal daily temperatures referred to the summer solstice (June 21), and those of lowest normal temperature to the winter solstice (Dec. 21). If the highest or lowest normal temperature is tabulated on 2 days, the first is selected as the date of highest or lowest as the case may be; if on 3 days, the middle one is selected; if on 4 consecutive days, the second; if 5, the third, and so on for any number of consecutive days having the same temperature.

In all instances the extremes of normal daily temperature *follow* the date of the solstice to which they have been referred. The dates of the extremes are to be regarded as those on which, on the average, a turn from rising to falling or from falling to rising temperature takes place; hence, too, they may be regarded as those times of the year when on the average there is exact balance between outgoing and incoming radiation—i. e., they are the summer and winter *thermal* solstices. These dates do not correspond to the days of possible maximum and minimum sunshine (the summer and winter astronomical solstices), but follow them in some instances by less than 10 days and in other instances by as much as 100 days. These time intervals have been plotted on charts of the United States and isochrones for differences of 10 days drawn to the plotted data.

The accompanying figure 1 shows the number of days between the date of the summer solstice and that of the highest normal daily temperature; and figure 2, the number of days from the winter solstice to the date of the lowest normal daily temperature for stations in the United States.

The writer does not recall having seen similar charts in any of the climatologies. This and the added fact that the charts present, in what seems to be an interesting way, the variations in the normal dates of occurrence of the warmest and coldest days of the year over a considerable area of the earth's surface, suggest the desirability of their incorporation in the climatology of the United States next to be written.

Figure 1 shows that the variation in time between the summer solstice and the dates of highest normal daily temperature is not to be attributed wholly to a latitudinal effect, although there is no doubt that this effect is predominant in the Rocky Mountain and plateau regions. Thus, at El Paso, Tex., the date of the highest normal daily temperature occurs 10 days after the summer solstice, while the period increases at Grand Junction, Colo., to 30 days; at Lander, Wyo., to 32 days; and at Kalispell, Mont., to 36 days. In the Middle Western, Eastern, Southern, and Pacific Coast States, the effect of latitude is largely hidden and subordinate to other influences. For example, the retardation of the dates of occurrence of the highest normal daily temperature along the Gulf of Mexico beyond that in the interior of the Gulf States is interesting, and no doubt owing to the slow warming of the surface waters of the Gulf of Mexico in comparison with the land surface of the interior. The winds being prevailingly from the Gulf of Mexico during the summer, the air temperature at coastal stations rises mainly with that of the water and therefore does not reach its maximum until late in the summer. This effect is seen in a retardation of the date of occurrence of the average warmest day of the year until 54 days after the summer solstice at Tampa, Fla., and 52 days at Brownsville, Tex.

Perhaps, too, the relatively early occurrence of the highest normal daily temperature in the interior of the Southeastern States is determined by the occurrence of the season of afternoon thunderstorms in this area, that results in lower afternoon temperature maxima than otherwise would be observed. These two effects are brought out in sharp contrast as between the Pensacola station, which is immediately on the coast, and Mobile, Ala., which is some distance inland. At Pensacola the retardation is 40 days beyond the summer solstice; at Mobile it is 18 days.

The effect of cool surface water in delaying the arrival of the highest normal daily temperature is quite pronounced along the Atlantic coast from Cape Hatteras, N. C., to Eastport, Maine, the maximum retardation being 41 days at the last-named station and 42 days at Atlantic City, N. J. But it is not until one examines the isochrones for the far West that the effect of a large surface of cool water and prevailing winds therefrom is fully realized. This effect reaches its maximum retardation of *100 days* beyond the summer solstice on the central California coast as shown by the record for San Francisco. A pronounced retardation of the date of the annual highest normal daily temperature beyond the summer solstice is general along other parts of the Pacific coast, but nowhere else is it as great as at San Francisco. This oceanic influence on retardation does not extend far inland; for example, the retardation is but 37 days at Sacramento as compared with 100 days at San Francisco—Sacramento is inland, and approximately 90 miles northeast of San Francisco. An influence of the cold surface waters of the Great Lakes in retarding the arrival of the highest normal daily temperature is also shown by the trend of the isochrones drawn to the data for this region.

Figure 2 shows that the retardation of the annual lowest normal daily temperature is least in the interior of the Gulf and South Atlantic States and in the far Southwest, reaching a minimum of only 6 days beyond the winter solstice at El Paso, Tex. The latitudinal effect is outstanding everywhere in the United States, although it is apparent that the effect of warm water surfaces enters into the physical processes that produce the larger retardations. Thus, the isochrone of 20 days retardation beyond the winter solstice skirts the coast of the Gulf of Mexico from Pensacola to extreme southern Texas. No doubt, the slow cooling of the surface waters of the Gulf of Mexico, together with the prevailing winds, accounts for this. Similarly, there is a pronounced retardation along the Atlantic Coast north of Cape Hatteras, N. C.; while over the region of the Great Lakes, and the area immediately to the eastward of them, there is a greater retardation of the arrival of the dates of lowest normal daily temperature beyond the winter solstice than is found elsewhere generally over the

interior of our country. This retardation is no doubt brought about by the slower cooling of the waters of the Great Lakes than that of the land areas adjacent to them.

These simple but outstanding effects of terrestrial controls, made manifest by a study of the normal daily temperatures, should make us pause in our contemplation of efforts to correlate variations in the so-called "solar constant" and local responses in temperature. It seems evident that anyone seeking to establish a relation between a change in the radiation from the sun and the local temperature should first take into consideration and determine the factor of terrestrial control that is peculiar to each observing station. This response for one station has a way of differing from that of other stations that is peculiarly its own. It might be 6 days, as at El Paso, or 100 days as at San Francisco.

TROPICAL DISTURBANCE OF AUGUST 18–25, 1935

By W. F. McDONALD

[Weather Bureau, Washington, September 1935]

The first indications of probable origin of this hurricane appeared on August 17, or possibly a little earlier, as a mild general disturbance of the normal trade-wind conditions over the lesser Antilles, attended by a slight but fairly widespread depression of the barometer, that became quite definitely localized during the night of the 17th-18th in the area around the intersection of the twentieth parallel and the sixtieth meridian. (The synoptic situation on the morning of August 18 is shown on chart IX.)

The American tanker *California Standard* made the first definite contact with the developing storm center on the morning of August 18, when a northeast gale was encountered near latitude 22° N., longitude 65° W. During that afternoon the wind rose at maximum to storm force (Beaufort 11) and the barometer fell to 29.55 inches, the lowest point, about 8 p. m., after which the wind shifted through east to southeast by south, holding the force of a whole gale (Beaufort 10) until the morning of the 19th. It would appear from these observations that the *California Standard* crossed the track of the storm not far in advance of the center, which at that time was moving west-northwest.

The next report which clearly identified the location and intensity of the cyclone was obtained from the American steamship *Angelina* which passed very close to the center about 5 a. m. of the 21st. This ship was then near 27° N., 68°30′ W. A barometer reading of 28.2 inches was observed, attended by hurricane winds which shifted from northeast through west to southwest, without a lull. The storm had by that time entered the recurve and was moving almost due northward; the *Angelina* was involved in the left-hand semicircle quite close to the center.

The hurricane moved on northward during the 22d, and on the morning of the 23d was central about 180 miles west of Bermuda. Shipping had been well warned of the approximate position and course of the disturbance, so that vessels successfully avoided the center, and it was not until the morning of the 24th that another ship was heavily involved.

The storm had by that time turned northeastward, and was moving at a much more rapid rate. The British steamer *York City* encountered the central region about 400 miles northeast of Bermuda, and there for 24 hours the vessel experienced storm conditions culminating about 5 a. m., August 24, in a south-to-west hurricane that lasted for 4 hours and caused considerable damage to the lifeboats and superstructures of the ship. The barometer fell to 28.71 inches (uncorrected) at the lowest point, when the ship was in a position 36°30′ N., 59°30′ W. The wind changes, from south-southeast through southwest to northwest, show that the *York City* passed fairly near and just behind the center of the storm, then moving rapidly northeastward.

The synoptic situation over the Atlantic on the morning of August 24, when the *York City* was in the hurricane, is shown in chart X. This chart also gives the full track of the hurricane center, which again turned northward during the 24th, and on the morning of the 25th was over Newfoundland. The disturbance rapidly diminished in intensity thereafter.

As the storm center passed over the Grand Banks, it caused heavy damage to fishing fleets and took a toll of lives estimated from press reports at upward of 50 in all, some as far northward as the Labrador coast. No life losses have been reported from the earlier movements of this hurricane.

The rate of progression during the first 5 days, while the cyclone moved from its origin within the Tropics to the waters west of Bermuda, averaged only 8 to 10 miles per hour. For the last 2 days, August 23 to 25, the rate of movement tripled and averaged nearly 30 miles per hour.

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SOLAR OBSERVATIONS

SOLAR RADIATION MEASUREMENTS DURING AUGUST 1935

By IRVING F. HAND, Assistant in Solar Radiation Investigations

For a description of instruments employed and their exposures, the reader is referred to the January 1935 REVIEW, page 24.

Table 1 shows that solar radiation intensities averaged above normal for August at all three stations for which normals have been computed. During this month the Marvin pyrheliometers at Madison and Lincoln were compared with substandard Smithsonian silver-disk pyrheliometer no. 1. The instrument at Madison was found to be in excellent condition with no apparent change in its characteristics. However, the Marvin pyrheliometer at Lincoln read slightly more than 1 percent low in the large number of comparisons made and new factors were determined for use at that station.

Table 2 shows an excess in the amount of total solar and sky radiation received on a horizontal surface at all stations except Madison, Lincoln, Riverside, and Fairbanks. About the middle of the month a new Eppley thermoelectric pyrheliometer was installed on the roof of the experiment station building at Lincoln, replacing the old Callendar receiver which had become defective. The new pyrheliometer records on a Leeds and Northrup micromax potentiometer, also installed at the same time, replacing the Callendar Wheatstone bridge formerly in use at Lincoln.

Neither turbidity nor polarization measurements were made in Washington during August because of reduced personnel during that month. Polarization measurements made at Madison on 8 days give a mean of 54 percent with a maximum of 58 percent on the 27th. Both of these values are below the August normals for that station.

TABLE 1.—*Solar radiation intensities during August 1935*

[Gram-calories per minute per square centimeter of normal surface]

WASHINGTON, D. C.

Date	Sun's zenith distance: 8 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon
	75th mer. time	Air mass: A. M.					P. M.				Local mean solar time
	e	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e
	mm	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm*
Aug. 5	14.10				0.78	1.44					8.81
Aug. 6	12.24	0.68	0.80	0.93	1.12	1.35					10.97
Aug. 12	18.59			.95	1.11	1.24					17.96
Aug. 14	18.59			.68	.86	1.14					19.23
Aug. 24	8.81			1.00	1.20	1.43					7.04
Means		(.68)	(.80)	.89	1.01	1.32					
Departures		+.05	+.11	+.12	+.07	+.08					
MADISON, WIS.											
Aug. 4	13.61				1.17						14.10
Aug. 8	15.11					1.30					16.79
Aug. 13	10.97		.91	1.05	1.21	1.39					10.59
Aug. 14	10.97	.65	.81	.92	1.13	1.38					13.11
Aug. 15	13.61	.52	.63	.79	1.00						14.10
Aug. 21	19.23			1.13	1.26						11.38
Aug. 23	12.68			.99	1.16						12.24
Aug. 24	13.13			.93	1.09						12.68
Aug. 26	13.61			1.05	1.22	1.45					10.59
Aug. 27	8.81			1.15	1.30	1.46					8.18
Aug. 28	6.76			1.19	1.33	1.51					7.29
Aug. 31	7.04		.94	1.08							6.76
Means		(.58)	.82	1.03	1.19	1.42					
Departures		−.17	.00	+.09	+.09	+.09					
LINCOLN, NEBR.											
Aug. 5	14.10				1.19			0.78	0.62	0.49	15.11
Aug. 6	17.96					1.38	1.18	.95	.77	.65	16.20
Aug. 7	18.62						1.10	.91	.75	.62	19.23
Aug. 8	16.79		.75	.91	1.11						11.38
Aug. 9	15.65		.81	.96	1.08	1.35					11.38
Aug. 10	17.37	.53	.63	.84	1.00	1.29					13.13
Aug. 11	12.24					1.43					10.59
Aug. 12	10.21						1.10	.97	.85	.76	7.57

TABLE 1.—*Solar radiation intensities during August 1935*—Contd.

[Gram-calories per minute per square centimeter of normal surface]

LINCOLN, NEBR.—Continued

Date	Sun's zenith distance: 8 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon
	75th mer. time	Air mass: A. M.					P. M.				Local mean solar time
	e	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e
	mm	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm*
Aug. 13	9.87					1.40	1.09	.88	.72	.60	8.48
Aug. 14	10.21	.71	.83	.96	1.18	1.42	1.15	.94	.79	.68	9.14
Aug. 15	14.10		.89	1.02	1.21		1.10	.92	.79	.66	12.24
Aug. 20	14.10					1.47	1.19	1.03	.89	.78	11.81
Aug. 21	12.24					1.44					11.81
Aug. 24	11.38	.57	.67	.87	1.11	1.34					7.04
Aug. 27	8.18	.93	1.03	1.18	1.33	1.50					6.50
Means		.67	.89	.96	1.15	1.40	1.13	.92	.77	.67	
Departures		−.02	+.01	+.05	+.06	+.09	+.05	+.03	+.01	+.01	
BLUE HILL, MASS.											
Aug. 1	14.3				1.12	1.25					12.8
Aug. 3	10.3		.97	1.07	1.27	1.45	1.26				9.2
Aug. 4	11.5		.86	1.04	1.19	1.36	1.22	1.11			12.3
Aug. 7	12.3		.93	1.04	1.23	1.45	1.21	1.05			8.8
Aug. 8	11.1	.79	.91	1.04	1.14	1.40	1.23	1.10			10.3
Aug. 9	10.7	.62	.84	.98	1.14	1.33	1.11				11.5
Aug. 10	13.2				1.13	1.21	.98				13.3
Aug. 12	13.7					1.15					16.9
Aug. 15	14.7			.94	1.11	1.30	1.10				13.2
Aug. 16	16.4				.94	1.12					12.8
Aug. 17	16.9			.90	1.04	1.24	.90	.72	.59		12.8
Aug. 18	13.7			.79	.96	1.24	.96				15.8
Aug. 19	13.7			1.05	1.23	1.28	1.11	.82			10.3
Aug. 21	19.5					1.20					15.3
Aug. 23	13.2					1.38	1.18	.96			11.1
Aug. 24	10.7				1.25	1.50	1.34				7.6
Aug. 25	8.6				1.06	1.45	1.20	1.07			7.9
Aug. 26	9.6					1.45	1.15				9.3
Aug. 29	8.8		.91	1.08	1.28	1.43					9.2
Aug. 31	10.7					1.25	1.19				10.3
Means		.70	.90	.99	1.14	1.32	1.14	.98	.59		

* Extrapolated.

TABLE 2.—*Average daily totals of solar radiation (direct+diffuse) received on a horizontal surface*

Week beginning—	Washington	Madison	Lincoln	Chicago	New York	Fresno	Pittsburgh	Fairbanks	Twin Falls	La Jolla	Miami	New Orleans	Riverside	Blue Hill	Friday Harbor	Ithaca	San Juan
	Gram-calories per square centimeter																
1935	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
July 30	518	355	535	369	512	718	547	248	660	594	557	512	558	647	513	367	762
Aug. 6	477	434	567	456	425	670	449	290	668	590	485	377	511	569	582	394	612
Aug. 13	522	442	514	354	478	665	625	307	615	444	526	335	539	602	494	517	727
Aug. 20	494	477	497	480	466	594	646	377	574	473	451	374	439	582	519	552	774
Aug. 27	312	411	238	366	306	615	445	269	545	286	447	474	398	314	439	377	555
	Departures from weekly normals																
July 30	+25	−108	+22	+1	+93	+63		−76	+118		−52	+129	−23				
Aug. 6	+15	−20	+72	+77	+57	+38		−16	+116		+39	+7	−55				
Aug. 13	+67	−3	+27	−31	+118	+52		−50	+130		−53	+2	−5				
Aug. 20	+61	+34	+15	+79	+143	+18		+3	+49		+47	+30	−76				
Aug. 27	−130	+5	−201	+10	−46	+55		−39	+54		+36	+100	−102				
	Accumulated departures on Sept. 2																
	−3,675	−8,694	−7,476	+252	+5,789	+4,844		+1,621	+4,648		−3,346	+308	−6,580				

BLUE HILL METEOROLOGICAL OBSERVATORY OF HARVARD UNIVERSITY

TABLE 3.—*Total, I_m, and screened, I_v, I_r, solar radiation intensity measurements, obtained during August 1935, and determinations of the atmospheric turbidity factor, β, and water-vapor content, w=depth in millimeters, if precipitated*

Date and hour angle	Solar altitude	Air mass	I_m	I_v	I_r	$\beta I_{m=7}$	$\beta I_{7=7}$	$\beta_{m=m}$	$\frac{I_{m=7}}{1.94}$	$\frac{I_{m=7}-I_m}{1.94}$	w	Air-mass type
Aug. 1, 1935	° ′	*m*	*gr. cal.*	*gr. cal.*	*gr. cal.*				*Percent*	*Percent*	*mm*	
4:38 a. m.	27 01	2.20	1.111	0.786	0.630	0.046	0.066	0.056	71.2	12.2	7.5	T_r
Aug. 3												
3:51 a. m.	35 18	1.73	1.295	.878	.709	.020	.074	.047	75.9	12.8	8.4	N_{rc}
1:54 a. m.	55 08	1.22	1.409	.942	.746	.025	.058	.042	83.2	8.4	11.2	T_r aloft
1:46 p. m.	56 10	1.20	1.392	.918	.729	.020	.077	.048	82.7	8.9	11.5	
2:54 p. m.	45 35	1.40	1.367	.908	.714	.011	.049	.030	85.3	12.8	10.2	T_a aloft
Aug. 4												
5:28 a. m.	17 19	3.33	.990	.726	.392	.039	.069	.054	62.1	9.7	3.8	N_{rc}
3:20 a. m.	40 50	1.53	1.202	.840	.697	.039	.089	.089	71.7	7.9	8.7	T_r+T_a aloft
1:44 a. m.	56 37	1.19	1.321	.898	.714	.032	.087	.060	81.9	10.8	11.8	
0:46 a. m.	63 10	1.12	1.352	.903	.719	.054	.096	.075	79.9	8.2	16.2	
2:42 p. m.	47 29	1.36	1.285	.858	.694	.047	.086	.066	78.1	10.0	10.2	
Aug. 7												
5:08 a. m.	20 28	2.84	1.055	.778	.629	.044	.052	.048	68.3	12.9	5.7	P_r
4:41 a. m.	25 28	2.32	1.131	.808	.656	.049	.070	.060	69.0	9.1	5.9	T_r aloft
0:44 a. m.	62 45	1.12	1.417	.954	.742	.017	.023	.020	85.7	10.6	6.3	
0:24 a. m.	63 47	1.12	1.417	.951	.736	.016	.025	.020	87.7	12.6	12.9	T_a aloft
0:22 p. m.	62 40	1.11	1.392	.921	.734	.036	.086	.061	81.5	7.7	11.5	
2:32 p. m.	48 35	1.33	1.372	.911	.719	.009	.093	.081	76.2	3.8	9.3	
4:56 p. m.	22 41	2.58	1.075	.783	.620	.043	.044	.044	71.3	14.3	5.6	
Aug. 8												
5:11 a. m.	18 55	3.06	1.032	.743	.613	.039	.066	.052	64.5	9.8	4.5	P_r
4:26 a. m.	28 16	2.10	1.136	.793	.642	.047	.083	.065	70.0	9.8	7.6	T_r aloft
3:26 a. m.	37 30	1.64	1.200	.875	.662	.052	.054	.053	76.8	13.2	8.7	
1:57 a. m.	53 59	1.24	1.324	.884	.682	.024	.056	.040	82.8	12.6	11.5	
1:24 p. m.	58 36	1.17	1.373	.894	.711	.020	.094	.057	80.4	7.6	11.0	
3:10 p. m.	41 58	1.49	1.325	.885	.700	.013	.063	.038	75.2	5.0	8.2	
4:44 p. m.	24 50	2.37	1.160	.800	.650	.028	.072	.050	70.5	9.0	5.8	
5:12 p. m.	19 39	2.96	1.100	.785	.625	.021	.037	.029	71.8	13.5	4.9	
Aug. 9												
4:47 a. m.	24 05	2.44	1.071	.772	.628	.050	.069	.060	68.0	11.2	5.8	
4:29 a. m.	27 25	2.15	1.130	.804	.655	.040	.068	.054	71.6	11.7	6.6	P_r
0:17 a. m.	63 32	1.11	1.310	.877	.692	.053	.121	.087	78.4	9.0	12.3	
0:32 p. m.	62 54	1.12	1.320	.886	.706	.057	.105	.081	78.9	9.0	13.2	
2:41 p. m.	46 46	1.37	1.237	.852	.679	.043	.094	.068	77.2	11.6	10.4	
Aug. 10												
4:30 a. m.	26 41	2.22	1.130	.793	.643	.044	.079	.062	74.3	14.5	7.4	N_{rs}
1:20 a. m.	58 24	1.18	1.195	.818	.652	.094	.098	.096	76.2	1.29	12.2	
3:26 p. m.	36 58	1.66	1.094	.776	.622	.099	.104	.102	68.5	8.8	8.4	
4:17 p. m.	29 27	2.03	.966	.703	.575	.102	.130	.116	62.0	11.1	6.9	
Aug. 12												
1:51 a. m.	53 53	1.24	1.004	.730	.592	.190	.195	.192	63.7	10.5	11.2	T_r
Aug. 15												
3:34 a. m.	36 18	1.69	1.163	.808	.641	.058	.080	.069	73.6	12.1	8.4	N_{rr}
1:27 a. m.	56 16	1.20	1.272	.865	.681	.035	.055	.045				
0:24 a. m.	61 31	1.13	1.302	.877	.681	.049	.058	.054	82.2	13.3	12.7	T_r aloft
0:18 a. m.	61 43	1.13	1.295	.872	.686	.049	.058	.054	82.2	13.7	12.8	
1:32 p. m.	55 40	1.21	1.292	.870	.681	.057	.107	.082	81.7	13.4	11.9	
4:23 p. m.	27 53	2.13	1.078	.765	.599	.058	.136	.097	63.7	6.7	6.2	
Aug. 16												
1:56 a. m.	52 13	1.27	1.058	.758	.600	.119	.146	.148	70.1	14.2	11.5	N_{rr} T_a+T_r aloft
Aug. 17												
5:06 a. m.	19 01	3.05	.895	.685	.570	.070	.063	.066	61.2	13.9	4.8	
4:22 a. m.	27 09	2.19	1.080	.750	.610	.050	.092	.071	67.3	10.2	6.3	N_{rr}
3:27 a. m.	37 09	1.65	1.100	.795	.640	.098	.105	.102	68.7	10.6	8.5	
1:41 a. m.	53 20	1.25	1.200	.835	.660	.089	.098	.094	75.0	11.6	11.4	T_r aloft
2:47 p. m.	44 05	1.41	1.025	.685	.600	.157	.091	.124	68.6	14.2	10.1	
3:06 p. m.	41 22	1.51	1.005	.680	.595	.135	.083	.109	69.6	16.8	9.8	
5:23 p. m.	15 53	3.61	.630	.490	.402	.101	.103	.102	46.0	12.7	9.0	
Aug. 18												
4:44 a. m.	22 54	2.56	.847	.631	.513	.091	.140	.115	56.0	11.5	5.5	T_a
3:54 a. m.	32 03	1.88	1.000	.725	.585	.093	.121	.107	68.2	15.4	8.4	T_r aloft
0:44 a. m.	59 31	1.16	1.210	.825	.660	.091	.150	.120	75.0	11.1	10.4	
0:58 p. m.	58 16	1.18	1.210	.830	.670	.094	.158	.126	72.4	8.5	11.9	
2:20 p. m.	48 08	1.34	1.176	.817	.639	.084	.086	.085	75.2	13.1	10.7	
2:43 p. m.	44 27	1.42	1.145	.812	.639	.096	.090	.093	73.3	12.8	10.3	
Aug. 19												
4:23 a. m.	26 32	2.24	1.157	.817	.666	.048	.104	.076	67.5	6.4	5.8	T_a
3:38 a. m.	34 43	1.75	1.247	.865	.684	.036	.091	.064	75.3	9.5	9.2	
2:27 a. m.	46 47	1.37	1.300	.875	.695	.042	.117	.080	75.8	7.1	9.7	T_r aloft
1:20 a. m.	55 57	1.20	1.282	.879	.687	.062	.122	.092	76.4	8.7	11.4	
1:08 a. m.	57 12	1.19	1.282	.874	.687	.064	.138	.101	75.0	7.3	11.2	
1:27 p. m.	53 57	1.24	1.262	.867	.676	.062	.118	.090	76.1	9.4	10.9	
2:35 p. m.	45 11	1.41	1.242	.857	.671	.051	.122	.086	74.1	8.5	9.6	
3:26 p. m.	36 51	1.67	1.188	.820	.656	.050	.132	.091	70.2	7.5	7.9	T_a
Aug. 21												
0:44 a. m.	51 35	1.17	1.293	.859	.679	.052	.100	.076	77.7	9.3	11.7	T_r aloft
Aug. 23												
0:45 a. m.	57 41	1.18	1.337	.895	.696	.031	.025	.028	80.0	9.5	11.6	N_{rc}
0:09 a. m.	59 19	1.16	1.322	.885	.696	.045	.042	.044	82.6	12.9	12.4	T_a aloft
0:04 p. m.	59 22	1.16	1.342	.895	.696	.032	.025	.028	85.9	15.1	12.4	
2:00 p. m.	49 46	1.30	1.322	.890	.696	.032	.033	.032	83.9	14.1	11.3	
4:29 p. m.	35 13	1.73	1.243	.859	.671	.031	.035	.033	80.2	15.1	8.5	
Aug. 24												
4:07 a. m.	28 21	2.10	1.232	.867	.691	.028	.043	.036	75.6	79.0	10.4	P_a
2:16 a. m.	47 10	1.39	1.403	.947	.748	.016	.025	.020	84.4	10.5	10.0	
0:31 a. m.	58 40	1.17	1.453	.972	.754	.003	.018	.010	86.7	10.1	11.8	
1:15 p. m.	55 17	1.21	1.448	.954	.764	.034	.077	.056	81.3	7.0	10.8	
Aug. 25												
4:25 p. m.	24 55	2.37	1.152	.802	.638	.027	----------	.027	75.6	14.9	6.2	N_{rc}
Aug. 26												
3:39 a. m.	57 14	1.19	1.408	.924	.736	.018	.079	.048	81.9	7.8	11.2	N_{rc}
2:57 p. m.	40 10	1.55	1.250	.850	.670	.038	.051	.044	79.6	13.8	8.7	T_a aloft
4:27 p. m.	24 38	2.39	1.065	.750	.595	.042	.062	.052	69.2	13.1	6.0	
Aug. 29												
5:15 a. m.	14 28	3.94	.945	.675	.565	.048	.085	.065	55.5	7.4	3.4	P_a
4:00 a. m.	28 12	2.12	1.250	.865	.700	.037	.063	.050	72.9	7.2	6.2	
1:49 a. m.	41 14	1.32	1.382	.920	.735	.029	.024	.026	84.9	12.2	6.1	
Aug. 31												
0:31 a. m.	55 57	1.20	1.245	.850	.682	.083	.112	.098	72.4	7.0	5.7	N_{rc}
2:24 p. m.	44 02	1.44	1.275	.855	.690	.046	.101	.074	75.2	8.2	5.4	
3:17 p. m.	35 32	1.72	1.230	.835	.675	.050	.097	.074	71.2	6.6	4.8	

Atmospheric conditions during solar radiation measurements. Blue Hill Observatory of Harvard University

Date and time from apparent noon	Air temperature	Wind, Beaufort scale	Visibility (scale 0–10)	Sky-blueness	Cloudiness and remarks
August 1935	° C.				
1; 4:34 a. m.	21.1	W 4	8		
3; 4:06 a. m.	17.8	NW 2	9	6	
3; 0:04 p. m.	24.2	NW 3	9	6	
4; 4:36 a. m.	20.0	NE 3	9	8	2 Acu, light haze.
4; 1:00 a. m.	22.8	NE 2	9	9	Few Acu, 1 Cu.
4; 2:30 p. m.	26.2	W 2	9	8	Few Acu, C Cu, no haze.
7; 4:52 a. m.	13.9	NW 3	8	9	4 Acu, Ci, inversion, light haze.
7; 0:38 a. m.	19.4	NE 4	9	9	3 Ci, few Acu, 1 Cu, light haze to N.
7; 2:44 p. m.	21.7	E 3	9	12	2 Ci, few Acu, few Cu, light haze to W.
8; 4:36 a. m.	17.8	NE 2	8	4	
8; 1:41 a. m.	20.6	NE 2	9	6	
8; 0:37 p. m.	20.7	NE 2	9		
8; 4:58 p. m.	20.6	NE 3	9	11	Few Ci, few Acu, few Cu, no haze.
9; 4:32 a. m.	17.2	N 4	8		Cist over sun?
9; 0:22 a. m.	22.8	NE 3	9		Cist.
9; 3:26 p. m.	23.4	E 3	9	4	Ci over sun.
10; 1:27 a. m.	23.9	SSW 4	8	4	Ci haze.
12; 2:18 a. m.	21.1	WSW 2	8		
15; 0:48 p. m.	24.8	E 3	8	6	Ci haze, Cu.
15; 4:25 p. m.	25.6	E 2	8-9	6	
16; 0:37 a. m.	28.2	E 2	7	6	4 Cu, mod. haze.
17; 4:30 a. m.	24.4	NNE 2	7	10	No clouds, dense haze.
17; 0:32 a. m.	28.8	ENE 2	8	6	2 Cu, mod. haze.
17; 3:00 p. m.	30.0	SE 2	8	4	1 Cu, Frcu, mod. haze.
18; 3:58 a. m.	23.9	NW 2	7-8	10	Few Ci, light haze.
18; 2:34 p. m.	31.7	ESE 3	8	8	3 Ci, few Cu, light haze.
19; 2:05 a. m.	23.9	WSW 2	8	8	1 Ci, light haze.
19; 1:33 a. m.	25.0	SSW 0	8	8	Few Ci, light haze.
19; 1:29 p. m.	26.7	SSW 3	9	8	Few Ci, light haze.
19; 1:25 p. m.	30.0	S 3	8-9	8	0 clouds, light haze.
23; 1:45 p. m.	19.4	SSW 5	9	8	2 Cu.
23; 3:17 p. m.	19.4	NE 4	9	10	2 Cu.
24; 2:33 a. m.	15.6	NW 3	10	10	1 Stcu.
24; 2:00 a. m.	16.1	NW 4	10	10	Cu.
24; 0:59 p. m.	18.9	NNW 4	10	10	1 Cu.
25; 4:27 p. m.	20.0	NW 6	10		
26; 0:17 a. m.	23.3	WSW 4	9	12	Few Acu, light haze on horizon.
26; 2:45 p. m.	25.0	WSW 5	9	12	1 Acu, light haze.
29; 4:21 a. m.	15.0	WNW 2	9	10	1 Ci, light water haze.
29; 2:07 a. m.	18.3	WNW 3	9	10	Light water haze.
31; 1:58 p. m.	19.4	W 3	9	7	7 Cu, light haze.

PROVISIONAL SUN-SPOT RELATIVE NUMBERS FOR AUGUST 1935

[Dependent alone on observations at Zurich and its station at Arosa]

[Data furnished through the courtesy of Prof. W. Brunner, Eidgen Sternwarte, Zurich, Switzerland]

August 1935	Relative numbers	August 1935	Relative numbers	August 1935	Relative numbers
1	10	11	29	21	55
2	11	12	38	22	39
3		13		23	34
4	*ad* 23	14	*d*	24	*d* 35
5	18	15	29	25	
6	28	16	26	26	29
7	43	17	*Wc* 20	27	*a* 13
8	49	18	29	28	25
9	26	19	23	29	*d* 28
10	*a* 33	20	*Mca* 52	30	24
				31	*d* 37

Mean, 27 days = 29.9.

a = Passage of an average-sized group through the central meridian.
b = Passage of a large group or spot through the central meridian.
c = New formation of a center of activity: E, on the eastern part of the sun's disk; W, on the western part; M, in the central circle zone.
d = Entrance of a large or average-sized center of activity on the east limb.

POSITIONS AND AREAS OF SUN SPOTS

[Communicated by Capt. J. F. Hellweg, U. S. Navy, Superintendent U. S. Naval Observatory. Data furnished by the U. S. Naval Observatory in cooperation with Harvard and Mount Wilson Observatories. The difference in longitude is measure from the central meridian, positive west. The north latitude is positive. Areas are corrected for foreshortening and are expressed in millionths of the sun's visible hemisphere. The total area for each day includes spots and groups]

Date	Eastern standard time	Heliographic			Area		Total area for each day	Observatory
		Diff. in longitude	Longitude	Latitude	Spot	Group		
1935	h. m.	°	°	°				
Aug. 1	13 20	−45.0	186.4	−19.0		46		U. S. Naval.
		−39.0	192.4	−16.5	62		108	
Aug. 2	14 14	−25.0	192.7	−17.0	46			Do.
		−10.5	207.2	−24.0		23	69	
Aug. 3	11 5	−11.5	194.7	−17.0	46			Do.
		+1.0	207.2	−23.0		31	77	
Aug. 4	12 0	−75.0	117.5	−18.0	127			Mount Wilson.
		+2.0	194.5	−16.0		58		
		+16.0	208.5	−24.0		10	195	
Aug. 5	11 3	−60.0	119.8	−19.5	123			U. S. Naval.
		+15.5	195.3	−17.0		39	162	
Aug. 6	11 2	−68.0	98.6	+28.0		69		Do.
		−48.5	118.1	−19.0		123		
		+28.5	195.1	−17.5		62	254	
Aug. 7	9 5	−57.0	97.5	+25.0		18		Mount Wilson.
		−55.0	99.5	−29.0		25		
		−36.0	118.5	−19.0		165		
		+44.0	198.5	−17.0		50	258	
Aug. 8	8 50	−42.0	99.4	−28.0		50		Do.
		−39.0	102.4	+26.0	4			
		−23.0	118.4	−19.0		120		
		+47.0	188.4	+26.0		9		
		+56.0	197.4	−17.0		15	198	
Aug. 9	11 54	−27.0	99.4	−28.0		31		U. S. Naval.
		−9.0	117.4	−19.0	62		93	
Aug. 10	11 14	−13.5	100.1	−29.0	23			Do.
		−12.0	101.6	−21.0		31		
		+3.5	117.1	−19.0	62		116	
Aug. 11	12 30	−48.0	51.6	−18.0		6		Mount Wilson.
		+0.5	100.1	−28.0	5			
		+1.0	100.6	−22.0		9		
		+4.0	103.6	+24.0	4			
		+18.0	117.6	−19.0	89		113	
Aug. 12	10 59	−36.0	51.3	−18.5		77		U. S. Naval.
		+11.5	98.8	−28.0	15			
		+15.0	102.3	−20.5		46		
		+29.5	116.8	−19.5	108		246	
Aug. 13	11 6	+42.0	116.0	−19.5		93	93	Do.
Aug. 14	10 55	−80.0	340.9	+19.0	62			Do.
		+42.0	102.9	−20.0	8			
		+58.0	118.9	−18.5		139		
		+81.0	141.9	+22.0		39	248	
Aug. 15	11 5	−68.0	339.6	+19.0	139			Do.
		+68.0	115.6	−19.5	46		185	
Aug. 16	12 25	−55.0	338.6	+19.0		174		Mount Wilson.
		−41.0	352.6	+29.0		5		
		+17.0	50.6	−18.0	1			
		+82.0	115.6	−18.0	60		240	
Aug. 17	11 3	−48.0	333.1	+19.5		8		U. S. Naval.
		−41.0	340.1	+19.5	139			
		+28.5	49.6	−19.0		62	209	
Aug. 18	10 48	−29.0	339.1	+19.0	123			Do.
		+42.0	50.1	−18.5		108	231	
Aug. 19	11 0	−15.0	339.7	+19.0	108			Do.
		+57.0	51.7	−18.5		201	309	
Aug. 20	12 45	−0.5	340.1	+19.0	166			Mount Wilson.
		+16.0	356.1	+28.0		428		
		+75.0	55.6	−18.0		126	720	
Aug. 21	12 38	+12.0	339.4	+18.5	123			U. S. Naval.
		+28.0	355.4	+28.5		525	648	
Aug. 22	14 41	+27.0	340.1	+18.5	123			Do.
		+43.0	356.1	+28.0		648	771	
Aug. 23	11 4	+39.0	340.8	+18.5	93			Do.
		+55.0	356.8	+28.0		710	803	
Aug. 24	11 12	−82.0	206.6	+30.5	154			Do.
		+51.0	339.6	+18.5	93			
		+70.0	358.6	+28.0		463	710	
Aug. 25	13 53	−66.0	208.0	+29.5	350			Harvard.
		+67.5	341.5	+19.0	130			
		+77.0	351.0	+29.5	240		720	
Aug. 26	12 45	−56.0	205.3	+30.0		339		Mount Wilson.
		−4.0	257.3	−28.0	2			
		+80.0	341.3	+17.0	16		357	
Aug. 27	14 59	−42.5	204.3	+30.5	216		216	U. S. Naval.
Aug. 28	14 32	−88.0	145.9	+20.5	93			Do.
		−30.0	203.9	+30.5		278		
		+61.0	294.9	−21.5		46		
		+78.0	311.9	−29.0	31		448	
Aug. 29	11 40	−76.0	146.2	+21.0	362			Mount Wilson.
		−18.0	204.2	+31.0		194		
		+79.0	301.2	−22.0	3		559	
Aug. 30	13 44	−60.0	147.9	+20.5	278			U. S. Naval.
		−7.0	200.9	+30.0		139	417	
Aug. 31	11 3	−72.0	124.2	+27.0	62			Do.
		−50.0	146.2	+20.5	247			
		+6.5	292.7	+30.0		123	432	
Mean daily area for 31 days							329	

AEROLOGICAL OBSERVATIONS

[Aerological Division, D. M. LITTLE, in Charge]

By L. T. SAMUELS

At those stations with a sufficient period of record for the determination of approximate normals, upper-air temperatures during August averaged close to normal. (See table 1 and footnote thereon.) Upper-air relative humidities averaged mostly above normal with departures of small to moderate magnitude. Of especial interest is the high average relative humidity at El Paso at the 4,000- and 5,000-meter levels as compared to all other stations. The lowest average relative humidity at the highest levels occurred over Sunnyvale.

The resultant winds for the month were in general as follows (see table 2): Directions were in most cases close to normal. Marked changes, however, occurred at Albuquerque and Oklahoma City, where the directions were almost due south at 4,000 meters and due north at 5,000 meters, as compared to a normal westerly component. Velocities were mostly above normal at 3,000 meters and mostly below normal at 4,000 meters.

TABLE 1.—*Mean free-air temperatures and relative humidities obtained by airplanes during August 1935*

TEMPERATURE (° C.)

Stations	Altitude (meters) m. s. l.																Number of observations
	Surface		500		1,000		1,500		2,000		2,500		3,000		4,000		5,000		
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	
Barksdale Field (Shreveport), La.[1] (52 m)	24.3		26.2		23.6		20.3		17.3		14.2		11.4		5.5		0.4		31
Billings, Mont.[2] (1,088 m)	16.5						18.6		15.9		12.8		9.3		2.1		−5.4		31
Boston, Mass.[1] (6 m)	19.1		19.8		16.9		13.6		11.0		8.3		6.1		0.3		−5.4		20
Cheyenne, Wyo.[2] (1,873 m)	15.1								16.5		16.3		13.9		6.5		−1.6		31
El Paso, Tex.[2] (1,194 m)	22.9						24.1		21.7		18.2		14.5		6.6		−0.3		31
Fargo, N. Dak.[2] (274 m)	15.8		18.7		17.3		15.4		12.6		9.9		6.8		0.5		−6.1		31
Kelly Field (San Antonio), Tex.[1] (206 m)	23.4		24.1		22.9		20.5		17.5		14.6		11.8		5.8		0.1		31
Lakehurst, N. J.[3] (39 m)	19.2		19.3		16.8		13.9		11.5		9.4		7.3		2.2		−3.2		31
Maxwell Field (Montgomery), Ala.[1] (52 m)	24.5		25.0		22.5		19.7		16.7		13.9		11.0		5.4		−0.2		28
Mitchel Field (Hempstead, L. I.), N. Y.[1] (29 m)	19.1		19.9		17.2		14.0		11.7		9.0		6.7		1.1		−4.7		30
Murfreesboro, Tenn.[2] (174 m)	22.2		23.6		21.2		17.7		14.5		11.5		8.4		2.5		−3.6		31
Norfolk, Va.[2] (10 m)	23.2	−0.8	22.9	−0.1	20.4	−0.3	17.9	+0.2	15.4	+0.7	13.1	+1.0	11.0	+1.5	6.0	+1.5	0.5	+1.4	28
Oklahoma City, Okla.[2] (391 m)	23.8		25.2		24.8		21.8		18.7		15.6		12.4		6.0		−0.1		31
Omaha, Nebr.[1] (300 m)	20.6	+1.3	22.8	+2.0	22.4	+0.8	20.4	+1.0	17.6	+1.1	14.9	+1.4	11.3	+1.1	4.6	+1.1	−1.4	+1.6	31
Pearl Harbor, Territory of Hawaii[3] (6 m)																			X
Pensacola, Fla.[3] (24 m)	25.3	0.0	24.0	+0.4	21.0	+0.2	17.8	+0.1	14.9	+0.2	12.0	+0.2	9.1	+0.2	3.1	+0.1	−1.9	+0.4	31
San Diego, Calif.[3] (10 m)	19.2	−1.6	19.6	+0.4	22.8	−0.1	21.6	−0.5	18.9	−1.3	15.5	−1.3	12.2	−1.2	5.4	−1.3	−1.3	−1.6	31
Scott Field (Belleville), Ill.[1] (135 m)	20.0		23.6		22.0		19.5		16.6		13.5		10.9		4.8		−0.5		28
Seattle, Wash.[3] (25 m)	12.7	(4)	13.6	(4)	13.3	−1.2	11.6	−0.8	9.6	−0.5	8.0	+0.1	6.1	+0.6	1.1	+1.0	−4.7	+1.0	25
Selfridge Field (Mount Clemens), Mich.[1] (177 m)	18.6		20.1		17.7		15.0		12.6		10.0		7.1		1.5		−4.3		31
Spokane, Wash.[2] (596 m)	14.6				18.2		16.8		12.9		9.2		6.0		0.3		−6.3		31
Sunnyvale, Calif.[3] (10 m)	15.4	−2.2	16.1	+0.3	21.9	+1.3	20.9	−0.4	18.3	−1.1	15.5	−1.3	12.4	−0.5	5.9	+0.4	−0.5	+0.4	24
Washington, D. C.[3] (13 m)	20.8	−1.6	20.7	−0.6	18.3	−1.0	15.7	−0.8	13.4	−0.3	10.4	−0.5	7.8	−0.4	3.2	+0.2	−1.8	+0.8	30
Wright Field (Dayton), Ohio[1] (244 m)	19.4		21.3		19.2		16.3		14.2		11.4		9.0		3.2		−2.3		31

RELATIVE HUMIDITY (PERCENT)

Barksdale Field (Shreveport), La.	83		63		63		66		62		62		58		54		41		
Billings, Mont.	48						42		41		42		45		47		49		
Boston, Mass.	80		65		67		64		59		52		47		35		28		
Cheyenne, Wyo.	62								61		54		50		53		62		
El Paso, Tex.	64						53		51		55		61		75		77		
Fargo, N. Dak.	85		66		61		61		59		55		55		51		46		
Kelly Field (San Antonio), Tex.	92		85		65		61		63		58		53		50		46		
Lakehurst, N. J.	90		76		74		77		72		65		60		58		53		
Maxwell Field (Montgomery), Ala.	86		75		76		75		73		70		70		63		51		
Mitchel Field (Hempstead, L. I.), N. Y.	92		72		71		77		73		66		61		58		48		
Murfreesboro, Tenn.	88		70		70		76		73		70		65		57		46		
Norfolk, Va.	85	+5	74	+3	70	+3	67	+1	68	+1	63	−1	55	−5	48	−1	41	−1	
Oklahoma City, Okla.	72		70		66		66		65		62		61		61		56		
Omaha, Nebr.	79	−2	65	−5	55	0	51	−2	51	−2	50	−2	54	+2	53	+3	49	+1	
Pearl Harbor, Territory of Hawaii																			
Pensacola, Fla.	88	+2	82	+3	83	+7	80	+6	78	+7	75	+7	72	+6	71	+6	66	+8	
San Diego, Calif.	89	+10	75	−2	50	+4	41	+4	40	+5	44	+7	47	+7	48	+5	46	+5	
Scott Field (Belleville), Ill.	88		62		61		55		55		54		47		43		37		
Seattle, Wash.	87	(4)	78	(4)	69	+3	66	+3	64	+4	57	+4	51	+5	39	+3	34	+3	
Selfridge Field (Mount Clemens), Mich.	87		73		73		68		60		58		56		56		50		
Spokane, Wash.	60				48		45		48		50		49		45		43		
Sunnyvale, Calif.	83	+7	75	−2	42	−5	33	+1	31	+4	30	+5	29	+5	28	+4	24	+4	
Washington, D. C.	84	+7	72	+3	73	+7	73	+6	67	0	67	+3	63	+3	53	0	51	0	
Wright Field (Dayton), Ohio	88		73		71		73		61		57		53		53		47		

[1] Army. [2] Weather Bureau. [3] Navy.

[4] Departures omitted because of difference in time of observations this month and those on which normals are based.
Observations taken about 4 a. m., 75th meridian time, except along the Pacific coast and Hawaii where they are taken at dawn.

NOTE.—The departures are based on normals covering the following total number of observations made during the same month in previous years, including the current month: Norfolk, 140; Omaha, 146; Pensacola, 186; San Diego, 172; Seattle, 62; Sunnyvale, 75; Washington, 212.

TABLE 2.—*Free-air resultant winds (meters per second) based on pilot-balloon observations made near 6 a. m. (E. S. T.) during August 1935*

[Wind from N=360°, E=90°, etc.]

Altitude (m) m. s. l.	Albuquerque, N. Mex. (1,554 m)		Atlanta, Ga. (309 m)		Billings, Mont. (1,088 m)		Boston, Mass. (15 m)		Cheyenne, Wyo. (1,873 m)		Chicago, Ill. (192 m)		Cincinnati, Ohio (153 m)		Detroit, Mich. (204 m)		Fargo, N. Dak. (274 m)		Houston, Tex. (21 m)		Key West, Fla. (11 m)		Medford, Oreg. (410 m)		Murfreesboro, Tenn. (180 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	343	1.7	15	0.6	338	2.6	285	1.3	277	2.6	193	0.9	32	0.6	226	0.6	153	0.9	337	0.7	130	2.3	209	0.6	212	0.5
500	------	------	349	0.1	------	------	297	4.3	------	------	230	3.2	190	1.1	225	1.5	174	1.0	202	4.1	121	4.2	270	1.0	196	1.9
1,000	------	------	197	0.7	------	------	286	3.4	------	------	264	4.1	276	3.3	255	3.1	202	2.7	186	3.5	122	4.6	290	1.8	246	2.3
1,500	------	------	254	0.9	93	2.0	280	3.4	------	------	280	5.1	267	5.1	264	4.2	276	4.8	163	2.6	126	3.9	46	0.4	265	2.7
2,000	71	0.7	270	1.0	147	0.6	287	3.0	262	3.0	273	6.0	267	5.4	275	6.4	279	6.1	153	2.6	127	3.6	73	0.7	268	2.5
2,500	193	1.8	235	1.1	259	3.2	277	4.0	231	4.5	275	7.0	267	5.3	273	7.1	272	8.0	136	2.2	126	3.7	235	2.7	264	2.4
3,000	212	2.2	216	0.4	260	6.2	283	4.1	242	4.7	288	7.3	264	5.4	273	7.5	271	9.6	118	2.0	111	3.6	225	4.8	254	2.6
4,000	190	1.0	320	1.3	265	11.5	297	2.5	265	4.7	290	7.5	285	8.1	271	8.6	292	10.5	108	2.3	112	2.9	235	6.2	288	2.7
5,000	28	2.2	262	1.3	265	12.7	37	2.3	257	6.3	------	------	------	------	------	------	------	------	104	3.1	------	------	244	8.0	------	------

Altitude (m) m. s. l.	Newark, N. J. (14 m)		Oakland, Calif. (8 m)		Oklahoma City, Okla. (402 m)		Omaha, Nebr. (306 m)		Pearl Harbor, Territory of Hawaii [1] (68 m)		Pensacola, Fla.[1] (24 m)		St. Louis, Mo. (170 m)		Salt Lake City, Utah (1,294 m)		San Diego, Calif. (15 m)		Sault Ste. Marie, Mich. (198 m)		Seattle, Wash. (14 m)		Spokane, Wash. (603 m)		Washington, D. C. (10 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	353	0.9	331	0.9	174	3.0	153	1.7	48	2.4	353	1.6	187	0.4	155	3.2	290	0.4	134	0.3	104	1.3	105	1.2	5	0.6
500	316	2.8	246	2.2	185	6.5	181	4.9	70	7.1	262	0.4	223	2.8	------	------	130	0.5	205	1.4	15	3.3	------	------	317	3.5
1,000	298	3.2	294	2.0	206	13.1	215	7.4	72	7.7	257	0.7	265	3.0	------	------	84	2.0	248	3.7	14	2.6	263	1.2	303	4.0
1,500	278	4.4	239	0.7	211	9.6	234	6.9	75	6.5	336	0.2	271	3.9	166	5.3	113	2.6	254	3.7	1	1.0	268	2.3	296	4.9
2,000	288	6.0	205	1.7	220	5.8	251	6.2	85	4.4	52	1.1	280	4.2	189	3.9	120	3.8	278	5.8	281	1.2	252	3.2	291	6.6
2,500	291	7.3	169	3.5	220	3.0	269	5.1	49	3.1	68	1.3	289	4.6	216	3.3	116	2.9	283	6.4	241	1.6	258	5.0	285	7.7
3,000	313	8.9	191	3.0	198	2.0	260	4.4	43	2.7	24	1.1	300	4.9	238	3.8	131	4.3	286	7.6	255	2.8	260	7.0	285	7.6
4,000	------	------	------	------	174	1.2	284	5.7	------	------	32	1.6	294	4.3	236	4.3	117	5.0	------	------	267	6.5	259	10.6	287	4.4
5,000	------	------	------	------	28	1.6	314	2.4	------	------	------	------	304	3.3	247	5.1	111	2.0	------	------	281	6.9	274	10.3	273	6.1

[1] Navy stations.

RIVERS AND FLOODS

[River and Flood Division, MONTROSE W. HAYES, in charge]

By RICHMOND T. ZOCH

Unusually heavy rains occurred over the Muskingum River Basin in Ohio on August 6 and 7. The resulting floods caused considerable damage and the loss of five lives. A detailed report on this flood will appear in a later issue of the REVIEW.

There were a number of floods in the small streams of Arizona, the most important being those of the 22d, near Wickenburg, which made 35 persons homeless; and on the 28th, near Dragoon, which overturned a transcontinental bus and drowned 5 persons.

The other floods of August were not of great importance.

HEAVY RAIN IN TEXAS, MAY 31

A very heavy rain and resulting flood occurred on May 31 near D'Hanis, Tex., in the Nueces River Basin; a report recently prepared by the official in charge, Weather Bureau Office, San Antonio, Tex., is of unusual interest and is printed in full below:

An excessive rainfall of great intensity occurred in Medina County, Tex., on May 31, 1935. Saco Creek flooded the town of D'Hanis, washed away 17 small houses, a mile or more of the Southern Pacific tracks, and a section of the highway. Five persons were drowned.

The Saco Creek Basin is approximately 50 miles west of San Antonio, and the watershed has an area of about 80 square miles. This section was visited by Mr. Dalrymple, an engineer from the United States Geological Survey, Austin, Tex., and J. H. Jarboe, United States Weather Bureau, San Antonio, Tex. An effort was made to determine amounts of rainfall and estimate the discharge. All available rainfall measurements were checked and crest stages at ranch houses examined. A rock house on the Lutz ranch, built in 1851, was flooded for the first time, and the highest water stages known occurred at all ranches.

The number of rainfall measurements is too small to support a definite statement of amounts. A circular water tank at the Woodward ranch, cleaned and dry before the rain as affirmed by all, is the best measurement obtained. This tank holds 21.84 inches, and ran over in less than 3 hours. A carbide can that holds 11.5 inches ran over at the Lutz ranch, as did a dip can hanging from a branch of a tree at another ranch. The last measured 13 inches. All ranchmen state that the rain fell in less than 3 hours. Using the

high crest stages reached at the different ranches as part evidence, the following conclusions have been reached:

That apparently 20 inches or more rainfall occurred over a small area on Saco Creek, approximately 12 miles above D'Hanis, and that 12 inches or more occurred at other points, with an average amount exceeding 9 inches over the entire watershed of approximately 80 square miles, and that the time required for this rain was less than 3 hours.

It seems almost impossible for water to fall at so rapid a rate, but slope measurements made by the United States Geological Survey engineers indicate a discharge of 265,000 second-feet from an area of about 80 square miles. So far as known, this much exceeds any rate of flow from an area of this size.

In connection with the above report it is of interest that the cooperative observer at Sabinal, Tex., a short distance west of D'Hanis, reported 7.70 inches of rain, which fell between 5 a. m. and 11 a. m.; and the cooperative observer at Hondo, Tex., a short distance to the east of D'Hanis, reported 9.15 inches in the same period. Both Sabinal and Hondo lie outside of the Saco Creek Basin.

The discharge of 265,000 second-feet from 80 square miles is 3,312½ second-feet per square mile. Since a rate of rainfall of 1 inch per hour is equal to a discharge of 645⅓ second-feet per square mile there must have been a rate of rainfall of 5.13 inches per hour from the entire drainage area in order to produce the discharge calculated from the slope measurements. This is assuming that the soil became completely soaked and a steady state had been reached. Even at this very high rate of rainfall it is very doubtful if a steady state had been reached in the short time of 3 hours. Therefore, if the discharge calculated from the slope measurements is correct, a rate of rainfall considerably in excess of 5 inches per hour must have occurred.

Table of flood stages in August 1935

[All dates are in August unless otherwise specified]

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
ATLANTIC SLOPE DRAINAGE					
Saluda:	*Feet*			*Feet*	
Pelzer, S. C.	6	20	20	7.1	20
Chappells, S. C.	13	21	22	14.8	22
		25	27	17.2	26
Santee: Rimini, S. C.	12	22	24	13.0	24
Savannah: Ellenton, S. C.	14	22	26	16.2	24
MISSISSIPPI SYSTEM					
Missouri Basin					
Solomon: Beloit, Kans.	18	30	30	19.4	30
Ohio Basin					
Tygart: Elkins, W. Va.	14	8	8	14.6	8
Walhonding: Walhonding, Ohio	8	7	8	16.9	7
Tuscarawas:					
Newcomerstown, Ohio	16	7	11	21.2	9
Coshocton, Ohio	11	7	13	24.6	8
Muskingum:					
Lock No. 10, Zanesville, Ohio	25	8	12	33.6	9
Lock No. 7, McConnellsville, Ohio	22	8	13	32.8	9
Lock No. 3, Lowell, Ohio	25	9	12	30.3	10
Little Kanawha:					
Glenville, W. Va.	23	7	8	28.2	8
Creston, W. Va.	20	8	9	21.0	8
Gauley: Summersville, W. Va.	10	8	8	12.1	8
Arkansas basin					
Purgatoire: Higbee, Colo.	4	18	18	4.2	18
		29	29	5.0	29
Canadian: Union, Okla.	6	8	8	6.0	8
		31	31	7.0	31
WEST GULF OF MEXICO DRAINAGE					
Nueces: Cotulla, Tex.	15	July 29	1	18.6	July 30

WEATHER OF THE ATLANTIC AND PACIFIC OCEANS

[The Marine Division, W. F. McDONALD, in Charge]

NORTH ATLANTIC OCEAN

By H. C. HUNTER

Atmospheric pressure.—The pressure averaged moderately above normal near the British Isles; and, apart from waters near Iceland and east Greenland, was mainly a little above normal over the middle and eastern portions of the North Atlantic; also near the North American coast from Labrador to Virginia, save near Nova Scotia and southern Newfoundland where it was below normal. From Nova Scotia to the Bermuda region and thence southwestward to the Greater Antilles the pressure averaged below normal, while it was slightly below over the Gulf of Mexico and the east Florida coast.

The highest pressure thus far reported was 30.53 inches, by the American steamship *Exochorda*, about 10 p. m., the 25th, a short distance north of Horta. The lowest reading was in a hurricane area, about 27° N., 68° W., at 5 a. m., the 21st when the American steamship *Angelina* noted 28.20 inches. Apart from hurricane areas the lowest is 28.74 inches, by the Swedish motorship *Blankaholm*, at 3 a. m., the 21st, near 53° N., 38° W.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure (sea level) at selected stations for the North Atlantic Ocean and its shores, August 1935*

Station	Average pressure	Departure	Highest	Date	Lowest	Date
	Inches	*Inch*	*Inches*		*Inches*	
Julianehaab, Greenland	29.75	.....	30.22	29	29.31	4
Reykjavik, Iceland	29.69	−0.12	30.06	30	29.28	8, 20
Lerwick, Shetland Islands	29.89	+.09	30.26	6	29.25	27
Valencia, Ireland	30.04	+.12	30.43	6	29.62	28
Lisbon, Portugal	30.01	−.01	30.17	2	29.77	29
Madeira	30.05	+.02	30.12	25	29.94	24
Horta, Azores	30.25	+.05	30.45	25	29.86	20
Belle Isle, Newfoundland	29.91	+.02	30.20	18, 19	29.28	3
				21, 23		
Halifax, Nova Scotia	29.98	−.03	30.30	18	29.62	2, 25
Nantucket	30.02	+.03	30.31	19	29.65	1
Hatteras	30.00	.00	30.16	18	29.82	7
Bermuda	30.05	−.09	30.14	1, 18	29.68	23
Turks Island	29.97	−.07	30.07	2, 12	29.89	20
Key West	29.97	−.01	30.15	3	29.87	31
New Orleans	29.95	−.03	30.17	3	29.80	23

NOTE.—All data based on a. m. observations only, with departures compiled from best available normals related to time of observations, except Hatteras, Key West, Nantucket, and New Orleans, which are 24-hour corrected means.

Cyclones and gales.—A LOW near Virginia on the 7th advanced over the ocean, first eastward, then toward

east-northeast, gaining strength during the 8th and 9th. The position of the center on the 10th was about 400 miles south of Newfoundland, and several steamers to westward of midocean reported gales; the greatest force, however, was only a strong gale (9). On the 11th and 12th the storm's course was more northerly, so it ceased to affect the chief steamship lanes.

Another LOW, central on the 16th near the southern tip of Greenland, gradually expanded to southward and eastward till it covered a large area; and for several days, especially the 19th to 21st, showed considerable strength. Numerous reports of gales encountered have been received from vessels then traversing the chief routes to northern Europe, between the 50th and 20th meridians. The American steamship *Scanpenn* reported the greatest force connected with this storm, namely 11. On the 22d and following days this storm withdrew to northeastward.

Tropical storms.—One West Indian hurricane passed through its whole life history during August 1935. Full discussion of the storm appears elsewhere in this issue, but reference is here made to the synoptic weather charts representing two stages of this storm's history. Chart IX, for August 18, illustrates the conditions existing over the Atlantic as the disturbance was emerging from the region of origin, advancing northwestward. On the night of the 18th the American motorship *California Standard* experienced whole gales, backing from northeast to southeast, near 23° N., 64° W., but the lowest barometer was only 29.55 inches.

On the morning of the 21st, as the storm was recurving northward, the American steamship *Angelina* recorded hurricane winds and a reading of 28.20 inches. Three days later the British freighter *York City* suffered considerable damage near the center, then about 36°30′ N., 59°30′ W. Chart X shows the situation on the 24th, when the center was near the *York City*, and gives also the approximate track of the center over its whole course.

During the 24th the storm turned northward near the 55th meridian, attended by heavy gales which caused much damage to fishing fleets and considerable loss of life over the Grand Banks and on the Newfoundland and Labrador coasts.

At the end of the month another tropical storm had appeared near the southeastern islands of the Bahama group. A full account of this will appear in the September REVIEW.

Fog.—Near the American coast from New Jersey to Nova Scotia and thence eastward between the fortieth and forty-fifth parallels there was much less fog than during July just preceding, no one 5° square in this strip showing more than 13 days. East of the forty-fifth meridian no fog whatever has been reported in this strip, although fog was more frequent than usual just to westward, over the southern Grand Banks region.

Between the forty-fifth and fiftieth parallels, from eastern Newfoundland to the twentieth meridian, fog was everywhere much more prevalent than usual during August, although it generally was not quite so common as it had been during July 1935. The greatest number of occurrences during August, 18 days, was noted not far east of Newfoundland, in the square 45° to 50° N., 45° to 50° W.

OCEAN GALES AND STORMS, AUGUST 1935

Vessel	Voyage		Position at time of lowest barometer		Gale began August—	Time of lowest barometer August—	Gale ended August—	Lowest barometer	Direction of wind when gale began	Direction and force of wind at time of lowest barometer	Direction of wind when gale ended	Direction and highest force of wind	Shifts of wind near time of lowest barometer
	From—	To—	Latitude	Longitude									
NORTH ATLANTIC OCEAN			° ′	° ′				*Inches*					
Tanamo, Am. S. S.	Alvaro Obregon.	Philadelphia	21 48 N.	90 23 W.	2	5p, 2	2	29.99	SE	SE, 8	SE	SE, 8	
Boston City, Br. S. S.	Swansea	Montreal	52 45 N.	50 24 W.	4	9a, 4	4	29.12	WSW	WNW, 8	WNW	WNW, 8	WSW-WNW.
Cardonia, Am. S. S.	Galveston	Barcelona	38 38 N.	63 46 W.	9	Noon, 9	9	29.48	NE	NE, 9	NNE	NE, 9	NE-NW.
Quistconck, Am. S. S.	New Orleans	Havre	40 30 N.	58 42 W.	9	2a, 10	11	29.30	SSE	SW, 8	WSW	WSW, 9	SSE-SW.
Bremen, Ger. S. S.	Cherbourg	New York	43 25 N.	51 54 W.	10	9p, 10	11	29.66	SSE	SSE, 5	WSW	S, 9	SSE-SW.
Makala, Belg. S. S.	Banana	Antwerp	43 58 N.	8 40 W.	12	6p, 12	13	29.76	N	NW, 5	N	N, 8	SW-NNW.
Northern Prince, Br. M. S.	Trinidad	New York	21 43 N.	65 00 W.	18	4p, 18	19	29.75	N	NNE, 6	ENE	ENE, 9	N-NNE-ENE.
California Standard, Am. M. S.	Cristobal	London	[1] 22 20 N.	64 00 W.	18	9p, 18	19	29.55	NE	NE, 11	SE	NE, 11	NE-ENE-SE.
General Greene, U. S. C. G.	Out from St. Johns.		58 37 N.	46 27 W.	20	9a, 20	20	29.35	ESE	SSE, 5	ENE	ENE, 9	SSE-ESE.
Blankaholm, Swed. M. S.	Gothenburg	New York	53 08 N.	38 30 W.	21	3a, 21	21	28.74	SW	SW, 9	NW	SW, 9	SW-NW.
Ponce, Am. S. S.	New York	San Juan	27 30 N.	66 45 W.	20	3a, 21	21	29.72	E	E, 9	S	SE, 10	E-SE.
Angelina, Am. S. S.	do	do	26 55 N.	68 30 W.	20	5a, 21	21	28.20	E	NE, 12	SW	W, 12	E-NE-W.
American Importer, Am. S. S.	Belfast	New York	50 37 N.	37 20 W.	21	6a, 21	21	29.34	SW	SW, 8	WNW	WNW, 10	SW-WNW.
Paul H. Harwood, Am. S. S.	New York	Aruba	[1] 26 38 N.	69 58 W.	20	7a, 21	21	28.54	NE	NW, 9	W	N, 10	NE-N-NW.
Champlain, Fr. S. S.	do	Havre	50 24 N.	26 06 W.	21	3p, 21	21	29.44	W	W, 8	W	W, 8	SW-W.
Lord Kelvin, Br. S. S.	Out from Falmouth.		50 15 N.	21 00 W.	21	6p, 21	23	29.54	SSW	SW, 8	NW	SSW, 9	SSW-WSW.
A. C. Bedford, Am. S. S.	Montreal	Cartagena	28 26 N.	66 24 W.	21	6p, 21	22	29.68	ESE	SE, 10	SSW	SE, 10	ESE-SE-S.
Scanpenn, Am. S. S.	Copenhagen	New York	57 32 N.	24 50 W.	21	Mdt., 21	22	28.78	SE	SE, 3	NW	NNW, 11	S-SE-NE.
Noreg, Nor. M. S.	Houston	Gibraltar	27 20 N.	71 40 W.	20	Mdt., 21	23	29.36	ENE	WNW, 10	WSW	W, 11	NW-W.
York City, Br. S. S.	Poti	Baltimore	[1] 36 30 N.	59 30 W.	23	5a, 24	24	[2] 28.71	S	S, 12	W	S, 12	SSE-S-NW.
Blankaholm, Swed. M. S.	Gothenburg	New York	45 25 N.	58 10 W.	24	11p, 24	25	28.86	ENE	NE, 8	W	W, 8	ENE-NW-N.
Waukegan, Am. S. S.	Havre	do	49 59 N.	12 00 W.	26	2p, 26	27	29.85	WSW	WNW, 8	WNW	WSW, 8	SW-WNW.
Hakonesan Maru Jap. M. S.	Cristobal	do	22 55 N.	74 30 W.	31	8p, 31	Sept. 1	29.67	SW	S, 10	SE	S, 10	SW-S.

[1] Position approximate.

[2] Barometer uncorrected.

OCEAN GALES AND STORMS, AUGUST 1935—Continued

Vessel	Voyage From—	Voyage To—	Position at time of lowest barometer Latitude	Position at time of lowest barometer Longitude	Gale began August—	Time of lowest barometer August—	Gale ended August—	Lowest barometer	Direction of wind when gale began	Direction and force of wind at time of lowest barometer	Direction of wind when gale ended	Direction and highest force of wind	Shifts of wind near time of lowest barometer
NORTH PACIFIC OCEAN			° ′	° ′				*Inches*					
Madoera, Du. M. S.	Manila	Los Angeles	35 06 N.	153 48 E.	5	10a, 4	6	29.70	ESE	SE, 4	ESE	SE, 8	None.
Steel Voyager, Am. S. S.	Los Angeles	Balboa	17 50 N.	103 00 W.	5	4p, 5	6	29.78	E	ESE, 7	ESE	ESE, 9	Do.
Arizonan, Am. S. S.	Balboa	Los Angeles	20 33 N.	106 53 W.	5	5p, 6	7	29.79	ESE	SE, 8	ENE	SE, 9	Do.
Athelsultan, Br. M. S.	San Francisco	Yokohama	36 09 N.	171 00 W.	6	Mdt., 6	6	29.80	SSE	S, 5	S	S, 8	SSE–SSW.
U. S. Grant, U. S. A. T.	do	Balboa	20 51 N.	108 03 W.	7	2p, 7	8	29.70	ESE	ESE, 8	SSE	ESE, 8	None.
William A. McKenney, Am. S. S.	Los Angeles	do	[1] 21 14 N.	107 46 W.	6	4p, 7	8	[2] 29.70	SSE	SE, 8	SSE	SE, 9	Do.
San Rafael, Am. S. S.	do	do	22 20 N.	109 09 W.	7	4a, 8	9	29.61	E	SE, 7	S	SE, 8	E–SE.
Ogura Maru, Jap. M. S.	Estero Bay	Yokohama	35 58 N.	167 52 W.	8	11a, 8	8	29.94	S	S, 10	S	S, 10	
St. Mihiel, U. S. A. T.	Balboa	Honolulu	15 47 N.	109 43 W.	8	4p, 8	9	29.72	S	SSW, 8	S	SSW, 9	None.
Steel Mariner, Am. S. S.	Los Angeles	Balboa	24 42 N.	112 30 W.	9	4a, 9	9	29.62	E	E, 8	ESE	ESE, 8	
Athelsultan, Br. M. S.	San Francisco	Yokohama	[1] 35 52 N.	166 12 E.	12	4p, 12	12	29.37	SSW	SW, 9	W	SW, 9	S–SW–W.
Golden Horn, Am. S. S.	do	do	46 42 N.	174 39 E.	15	10a, 15	15	29.58	WSW	W, 6	W	W, 8	SW–W.
Forbes Hauptman, Am. S. S.	Los Angeles	Balboa	17 02 N.	101 32 W.	18	5p, 18	20	29.56	SW	WNW, 3	NW	SSW, 10	NW–SSW.
Steel Traveler, Am. S. S.	Balboa	Honolulu	11 36 N.	94 58 W.	17	4p, 19	20	29.79	SW	SW, 7	SSW	SW, 9	SW–W.
Steel Trader, Am. S. S.	San Diego	Balboa	14 42 N.	96 06 W.	19	4a, 20	20	29.76	WSW	W, 7	W	WSW, 8	WSW–W.
San Jose, Fr. S. S.	Los Angeles	do	17 48 N.	103 21 W.	20	6p, 20	21	29.63	ENE	ENE, 7	ESE	SW, 9	N–ENE–SW.
Harry Luckenbach, Am. S. S.	Balboa	Los Angeles	20 44 N.	107 23 W.	20	3p, 21	21	29.30	SE	NE, 10	NE	E, 11	N–NE–E.
Edgar F. Luckenbach, Am. S. S.	Los Angeles	Balboa	18 34 N.	104 28 W.	21	4a, 21	21	29.39	NE	ESE, 6	S	SSE, 9	NE–ESE–S.
Montanan, Am. S. S.	do	do	20 39 N.	107 18 W.	21	3p, 21	22	29.42	ENE	E, 10	SE	SE, 11	N–E–SSE.
Virginia, Am. S. S.	do	do	20 30 N.	107 24 W.	21	5p, 21	22	29.12	NW	ESE, 11	ESE	ESE, 11	NW–E–S.
Hakonesan Maru, Jap. M. S.	do	do	19 40 N.	106 00 W.	21	9a, 21	22	29.29	N	SE, 11	SE	SE, 11	N–SE–S.
West Cactus, Am. S. S.	do	do	23 52 N.	112 31 W.	23	3p, 23	23	29.32	NNE	NNW, 11	WSW	NW, 11	NNE–NW.
City of San Diego, Am. M. S.	Fishing grounds out from San Diego.		24 38 N.	111 55 W.	22	4p, 23	24	29.59	ENE	ESE, 9	S	SSE, 11	E–ESE–SE.
Pres. Grant, Am. S. S.	Seattle	Yokohama	51 24 N.	170 36 W.	21	1a, 22	24	29.49	SW	S, 8	W	W, 8	SW–S–WSW.
Athelsultan, Br. M. S.	Yokohama	San Francisco	42 35 N.	167 00 W.	30	2a, 31	30	29.59	S	S, 7	S	S, 8	S–SW.

[1] Position approximate.

[2] Barometer uncorrected.

NORTH PACIFIC OCEAN, AUGUST 1935

By WILLIS E. HURD

Atmospheric pressure.—Practically normal barometric conditions prevailed over the North Pacific Ocean during August 1935. The greatest monthly departures from normal occurred in the western Aleutian region, +.08 inch, and at Midway Island, −.08 inch. The greater part of the eastern half of the ocean, except to the southward of the Hawaiian Islands in midocean, and south of Cape Mendocino, along the North American coast, was dominated by anticyclonic conditions. Low pressure prevailed over the Far East. The Aleutian LOW, shallow as in the preceding month, lay over the Bering Sea.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure at sea level, North Pacific Ocean, August 1935, at selected stations*

Stations	Average pressure	Departure from normal	Highest	Date	Lowest	Date
	Inches	*Inch*	*Inches*		*Inches*	
Point Barrow	29.97	+0.08	30.36	12	29.48	2
Dutch Harbor	29.93	+.07	30.58	2	29.30	24
St. Paul	29.86	+.08	30.60	12	29.26	23
Kodiak	29.95	+.09	30.34	12	29.64	23
Juneau	30.00	−.02	30.35	26	29.49	5
Tatoosh Island	30.06	+.06	30.34	11	29.81	17
San Francisco	29.89	−.03	30.01	7	29.75	19
Mazatlan	29.83	−.01	29.92	12, 13	29.58	21
Honolulu	30.01	.00	30.08	4	29.91	10
Midway Island	30.00	−.08	30.14	20	29.72	6
Guam	29.80	−.02	29.90	8, 9	29.60	21
Manila	29.77	+.03	29.88	10	29.62	4
Hong Kong	29.64		29.86	19	29.29	6
Naha	29.71	+.02	29.92	18	29.44	26
Chichishima	29.82	+.06	29.98	30	29.58	7
Nemuro	29.82		30.14	15	29.22	29

NOTE.—Data based on 1 daily observation only, except those for Juneau, Tatoosh Island, San Francisco, and Honolulu, which are based on 2 observations. Departures are computed from best available normals related to time of observation.

Cyclones and gales.—Outside of the Tropics, although there was some cyclonic activity in middle and higher latitudes to the westward of longitude 160° W., few gales resulted. These occurred on scattered dates and in scattered positions and, except in two instances, did not exceed force 8. The two heavier gales were reported as follows: Of force 10 from the south on the 8th, near 36° N., 168° W., and of force 9 from the southwest on the 12th, near 36° N., 167° E. A moderately deep cyclone moved eastward at some distance south of the Aleutians, 29th to 31st, but was attended only by widely separated moderate to fresh gales. Along the coast of the United States a fresh northerly gale was experienced on the 14th northwest of San Francisco.

Typhoons.—Subjoined is a report on the typhoons of the Far East for August 1935 prepared by the Rev. Bernard F. Doucette, S. J., of the Philippine Weather Bureau. The only additional comment worthy of place here pertains to the typhoon of July 31–August 12 which struck southwestern Japan on the 11th. A press report of that date from Tokyo said that central Japan was ravaged by the storm and attendant floods which left some 200,000 persons homeless and damaged property to the extent of more than a million dollars.

Cyclones off the west coast of Mexico.—Two cyclones developed in Mexican west coast waters during the month. The earlier first appeared on the 5th near 18° N., 103° W. It followed a general west-northwesterly course and was lost to observation on the 9th, near 25° N., 113° W. The highest wind reported in connection with it was of force 9, near 18° N., 103° W., on the 5th, and near 21° N., 107–108° W., on the 6th and 7th. The lowest barometer reported was 29.61, read on the American steamship *San Rafael* near 22° N., 109° W., on the 8th.

The later cyclone originated to the southward of the Gulf of Tehuantepec on the 17th. From the 18th to 20th, scattered westerly to southwesterly gales, varying in force from 7 to 10, occurred with little reference to storm progression between the locality of origin and a position to the westward of Acapulco, thus indicating early lack of organization of the storm. On the 20th,

however, a definite depression center was located inland approximately between but slightly to the north of Salina Cruz and Acapulco.

Early on the 21st the wind circulation, the depth of the barometer, and the augmented force of the wind, showed a definite center located at sea about 70 miles south-southwest of Cape Corrientes. At 9 a. m. the Japanese M. S. *Hakonesan Maru*, in 19°40′ N., 106°00′ W., experienced a wind-force of 11 from the southeast, barometer 29.29. At 5 p. m. of that date the American steamship *Virginia*, in 20°30′ N., 107°24′ W., had an east-southeast wind of force 11, barometer 29.12, the lowest recorded in connection with the storm.

Near hurricane wind velocities occurred over a small area at the entrance to the Gulf of California on the 22d, as the cyclone moved slowly northwestward toward a position slightly to the westward of Cape San Lucas.

On the 23d, in 23°52′ N., 112°31′ W., the American S. S. *West Cactus* had a northwesterly wind of force 11, which led to the belief that the center was proceeding into the Gulf, whereas it was closely hugging the west coast of the Peninsula. After the 23d the disturbance rapidly lost energy, and on the 26th entered the California coast as a very shallow depression near Point Conception.

Fog.—Generally, over the North Pacific, there was materially less fog this month than in the preceding July. Along the Washington coast fog was reported on 4 days; along the California coast, on 7 days; and along the coast of Lower California, on 6 days. Along the northern steamship routes fog was encountered between 135° W. and 155° W., in the general neighborhood of the 50th parallel, on the 22d to 25th. The percentage of frequency increased generally to the westward, with the foggiest areas, having about 30 percent of days with fog, being those embraced within the squares 45°–50° N., 170°–175° E., and 40°–45° N., 150°–155° E.

TYPHOONS OF THE FAR EAST, AUGUST 1935

By BERNARD F. DOUCETTE, S. J.

[Weather Bureau, Manila, P. I.]

There were three typhoons during this month—possibly four, as explained below. The first one, coming early in the month, caused heavy rains over the northern part of the Archipelago. After this typhoon, came a period of high pressure during which the meteorological conditions were very similar to those of April and May. During the last 10 days of the month, the other typhoons occurred.

Typhoon of August 1 to 12.—On August 1, soon after the typhoon of July 22 to 31 had filled up over the continent, a typhoon started from a position about 600 miles east of the Balintang Channel, in a northwesterly direction toward Formosa, but changed on August 4 to a westerly course as it crossed that island. After entering the continent it soon recurved to the northeast, passed on the 8th into the Yellow Sea, crossed Korea and, finally, moving eastward, passed over the southern part of Honshu.

As this typhoon crossed Formosa, the winds weakened without an accompanying rise in pressure. Instead, the circulation over the southwestern sector increased so much that the Taihoku Observatory called this portion a secondary cyclone. When both the primary and the secondary circulations moved into the continent, they combined about a single center.

When this storm, on approaching Formosa, was about 400 miles north-northeast of Aparri (August 3), heavy rains fell along the western coast of Luzon and over the provinces between Manila and Baguio. Since these were soon after the rains of the last typhoon of July, extensive floods resulted. Furthermore, the Agno, Pampanga, and Angat Rivers overflowed their banks because of the heavy rains in the mountains east of the plains. The loss of life was not great (265 deaths being the total given by the newspapers of August 9), considering that whole provinces were under at least 3 feet of water. Besides, there were no violent winds and after it stopped raining the water subsided very quickly. Property loss, consisting of animals and crops, was quite large, and considerable relief work was required from the Red Cross Society.

Rainfall

[24 hours beginning 6 a. m.]

	Baguio, Mountain Pr.	Dagupan, Pangansinan Pr.	Iba, Zambales Pr.	Manila, Rizal Pr.
	Inches	*Inches*	*Inches*	*Inches*
Aug. 1	25.51	8.72	3.94	4.57
Aug. 2	19.47	6.78	2.62	5.14
Aug. 3	19.38	5.21	.80	4.90
Aug. 4	8.76	1.61	.28	.22
Aug. 5	3.15	.30	.61	Trace

Typhoon of August 18 to 29.—This typhoon, which formed after an extensive and persistent high pressure began to weaken, showed its presence as a low-pressure area north of Guam on August 17 and 18. As a depression, it moved west until August 21, then changed to the northwest about 600 miles east of Luzon. It passed close to and northeast of Basco, and on the 23d over southern Formosa, and changed thereafter to a westerly course. On the 26th, it would have entered the continent, if it had continued its velocity of the preceding days. Yet, from the observations available, it apparently did not enter the continent, certainly not to any great distance. Then, on the 27th, a definite center appeared near Pratas, moved northward, crossed Formosa and filled up over the Meiaco-Sima Group. During these days, Swatow did not send observations, and until these are available, the course of the typhoon or typhoons cannot be decided with certainty. It seems, however, that there was only one typhoon. It did not enter the continent. Instead of continuing on the westerly course which it had taken across the Formosa Channel, it appears to have changed to the southwest, then southeast, into a position between Pratas and Basco, where it intensified, and then on the 28th and 29th moved northeastward over Formosa.

Typhoon of August 20 to 30.—Forming northeast of Guam, this typhoon pursued its course over ocean regions, until it reached Japan. From August 22 to 24 it moved northwest, gradually changed to the north-northwest and came on the 27th close to the Nansei (Loo-choo) Islands. Over southern Japan, it changed its course to the northeast and crossed Honshu during the 29th, moving at a rapid rate toward Nemuro. In Japan, according to Manila newspapers of August 30, there were 42 deaths and much property damage.

CLIMATOLOGICAL TABLES

CONDENSED CLIMATOLOGICAL SUMMARY

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures, with dates of occurrence; the stations reporting the greatest and least total precipitation; and other data as indicated by the several headings.

The mean temperature for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.

Condensed climatological summary of temperature and precipitation by sections, August 1935

[For description of tables and charts, see REVIEW, January, p. 37]

Section	Temperature								Precipitation					
	Section average	Departure from the normal	Monthly extremes						Section average	Departure from the normal	Greatest monthly		Least monthly	
			Station	Highest	Date	Station	Lowest	Date			Station	Amount	Station	Amount
	°F.	°F.		°F.			°F.		In.	In.		In.		In.
Alabama	81.5	+1.8	Decatur	107	[1] 1	St. Bernard	51	30	5.09	+0.65	Robertsdale	13.43	Tuscumbia	0.89
Arizona	79.1	−.9	Quartzsite	118	11	Fort Valley	34	17	3.85	+1.53	Santa Marguerita	9.09	Gila Bend	.27
Arkansas	82.0	+2.1	Hot Springs	113	10	2 stations	46	31	1.74	−1.91	Jessieville	5.43	Helena	.18
California	73.0	+.6	Cow Creek	121	11	Twin Lakes	28	1	.34	+.24	Amago	3.67	55 stations	.00
Colorado	68.2	+2.8	Lamar	107	11	Pearl	25	27	1.77	−.19	Rico	6.23	Haswell	T
Florida	81.9	+.5	De Funiak Springs	102	5	Davie	57	12	8.85	+1.78	Pensacola	21.43	West Palm Beach	1.41
Georgia	80.4	+.9	Millen	105	4	Blairsville	46	31	5.59	+.42	Clayton	11.59	Washington	1.28
Idaho	66.2	−.2	Hazelton	111	9	Atlanta	16	16	.22	−.38	Gibbs	1.47	27 stations	.00
Illinois	75.7	+1.7	Carbondale	104	7	Mount Carroll	37	29	2.59	−.76	Cicero	8.20	Grafton	.25
Indiana	75.2	+1.9	2 stations	102	[1] 2	Mauzy	39	31	3.12	−.26	Scottsburg	7.68	Logansport	.82
Iowa	73.6	+1.7	Lenox	107	9	2 stations	34	28	2.42	−1.12	Little Sioux	6.81	Mount Ayr	.38
Kansas	80.4	+2.9	4 stations	112	[1] 1	do	43	30	2.95	−.22	McFarland	11.65	Dresden	.20
Kentucky	77.0	+1.4	Lovelaceville	105	6	Greensburg	42	31	4.22	+.49	Frankfort	.54	Russelville	.84
Louisiana	83.3	+1.5	Plain Dealing	110	[1] 9	Tallulah	54	29	4.43	−.63	Port Eads	10.74	2 stations	1.43
Maryland-Delaware	74.1	+.9	Keedysville, Md	100	13	Oakland, Md	36	29	3.27	−1.05	Grantsville, Md	7.64	Elkton, Md	1.01
Michigan	68.5	+1.9	2 stations	100	1	Sidnaw	28	29	3.64	+.99	Eau Claire	10.34	Bay City	1.55
Minnesota	68.8	+1.5	do	102	15	2 stations	28	31	4.52	+1.34	Waseca	10.11	Montevideo	1.77
Mississippi	83.0	+2.4	3 stations	109	[1] 8	Batesville	52	29	2.71	−1.57	Bay St. Louis	11.67	Greenwood	T
Missouri	77.7	+1.5	Dean	110	[1] 8	7 stations	45	28	2.26	−1.65	Garber	5.01	Brunswick	.18
Montana	64.5	−.2	Garland	110	10	Upper Yaak River	22	15	.62	−.52	White Sulphur Springs.	2.10	Conrad	.04
Nebraska	75.3	+2.4	3 stations	110	11	Nenzel (near)	30	30	2.68	−.14	Wakefield	9.29	2 stations	T
Nevada	72.6	+2.2	Logandale	114	12	Sheldon	29	1	.38	−.13	Lewers Ranch	3.10	8 stations	.00
New England	68.3	+1.5	2 stations	104	[1] 18	Pittsburgh, N. H.	34	[1] 24	1.97	−1.88	Gloucester, Mass	4.60	Lake Konomoc, Conn.	.25
New Jersey	72.4	+.6	Burlington	98	13	Runyon	36	25	2.57	−2.18	Indian Mills	6.34	Culvers Lake	.11
New Mexico	71.0	+.4	Nara Visa (near)	110	[1] 2	Therma (near)	31	[1] 13	3.53	+1.04	Chacon	8.51	Bernardo	.05
New York	68.5	+1.2	2 stations	96	[1] 16	Indian Lake	31	24	2.26	−1.50	Woodhull	6.40	Bridgehampton	.73
North Carolina	76.4	+.6	3 stations	104	[1] 4	Banners Elk	38	31	5.13	−.39	Swansboro	14.80	Hickory	1.27
North Dakota	66.2	.0	2 stations	109	14	2 stations	26	[1] 28	2.34	+.30	Fullerton	6.64	Howard	.28
Ohio	73.2	+1.7	Bowling Green	102	1	3 stations	39	31	6.06	+2.68	Newcomerstown	14.21	Pleasant Hill	1.52
Oklahoma	83.9	+2.7	Cloud Chief	115	11	Boise City	50	30	2.66	−.34	Hennessey	6.27	Boise City	.52
Oregon	65.5	+.1	2 stations	110	12	2 stations	20	16	.20	−.22	Jacksonville	1.31	5 stations	.00
Pennsylvania	71.3	+1.3	3 stations	98	1	Gouldsboro	31	25	3.91	−.26	Newell	9.96	York Haven	.87
South Carolina	79.2	+.4	Society Hill	106	4	2 stations	51	[1] 26	6.67	+.97	Yemassee	11.15	Darlington	3.61
South Dakota	72.6	+2.1	Cottonwood	113	7	Pollock	28	28	1.80	−.49	Canistota	7.99	2 stations	.03
Tennessee	79.3	+2.8	Etowah	108	7	Rugby	39	31	2.96	−1.07	Morgan Springs	7.99	Jackson	.31
Texas	83.9	+1.1	2 stations	112	10	Spearman	50	30	1.54	−.90	Claude	7.60	7 stations	.00
Utah	71.3	+1.6	St. George	108	11	Soldier Summit	28	2	.95	−.10	Mt. Baldy Ranger Station.	3.14	Grouse Creek	.00
Virginia	74.5	+.5	5 stations	100	[1] 1	Burkes Garden	37	31	3.86	−.48	North River Dam	9.14	Radford	.84
Washington	64.3	−1.5	Alpowa Ranch	107	9	4 stations	29	[1] 15	.60	−.26	Paradise Inn	3.16	3 stations	.00
West Virginia	73.2	+1.6	Martinsburg	101	1	Bayard	33	29	6.71	+2.63	Sutton	11.45	Bluefield	1.78
Wisconsin	68.8	+1.4	2 stations	96	[1] 1	2 stations	29	29	4.12	+.93	Hillsboro	9.34	Plum Island	.85
Wyoming	65.2	+1.4	Colony	110	23	Lake Yellowstone	18	20	.78	−.32	Devil's Tower	2.42	Thermopolis	T
Alaska (July)	57.2	+1.1	Nenana	89	8	Barrow	30	[1] 11	3.27	+.51	Mt. Roberts (b)	15.42	2 stations	.09
Hawaii	75.6	+.4	2 stations	93	[1] 16	Kanalohuluhulu	49	10	3.75	−2.65	Hilos - Mamawaio-puna Divide.	17.00	5 stations	.00 N
Puerto Rico	78.4	−.5	Aguirre	98	26	Guineo Reservoir	53	24	8.50	+.89	Guineo Reservoir	20.06	San Francisco	3.45

[1] Other dates also.

TABLE 1.—*Climatological data for Weather Bureau stations, August 1935*

[Compiled by Annie E. Small, by official authority, U. S. Weather Bureau]

District and station	Elevation of instruments: Barometer above sea level	Thermometer above ground	Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Sea level, reduced to mean of 24 hours	Departure from normal	Temperature of the air: Mean max + mean min. ÷2	Departure from normal	Maximum	Date	Mean maximum	Minimum	Date	Mean minimum	Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Departure from normal	Days with 0.01, or more	Wind: Total movement	Prevailing direction	Maximum velocity: Miles per hour	Direction	Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month.
	Ft.	Ft.	Ft.	In.	In.	In.	°F.	°F.	°F.		°F.	°F.		°F.	°F.	°F.	°F.	%	In.	In.		Miles								0-10	In.	In.
New England							69.0	+1.6										77	1.88	−1.7										4.5		
Eastport	76	67	85	29.91	29.99	+0.03	63.8	+3.1	90	17	72	48	25	55	27	59	57	85	2.13	−0.9	11	5,846	sw.	26	sw.	28	10	9	12	5.9	0.0	0.0
Greenville, Maine	1,070	6	40	28.8	30.01		64.0		89	17	74	40	30	58	31				2.01		14	3,143	se.	19		2	12	11	8		.0	.0
Portland, Maine	103	82	117	29.88	30.09	+.02	69.0	+2.6	91	18	77	54	30	61	22	62	59	74	2.69	−.4	11	6,136	sw.	21	s.	10	19	8	4	3.3	.0	.0
Concord	289	66					68.8	+2.0	93	18	81	47	30	57	32				1.77	−1.8	8		ne.				15	10	6		.0	.0
Burlington	403	11	48	29.56	29.99	+.02	67.8	−.1	90	18	78	42	30	58	27				3.26	−.1	11	6,160	s.	29	se.	27	11	14	6	4.5	.0	.0
Northfield	876	12	60	29.09	30.01	+.03	64.6	+1.5	91	18	77	38	24	52	36	60	58	83	2.77	−.8	11	4,732	s.	21	sw.	1	6	18	7	5.5	.0	.0
Boston	124	336	360	29.87	30.00	+.01	70.7	+.8	90	18	78	54	27	63	24	65	59	69	2.14	−1.5	5	9,064	sw.	33	nw.	25	13	11	7	4.6	.0	.0
Nantucket	12	14	90	30.06	30.01	+.02	69.6	+1.8	86	18	76	56	30	63	26	65	62	82	2.18	−1.2	7	8,422	s.	30	n.	5	18	7	6	4.0	.0	.0
Block Island	26	11	46	29.99	30.02	+.06	70.0	+1.5	84	14	76	55	31	64	17	66	64	85	1.02	−2.6	5	8,035	s.	27	nw.	25	15	10	6	4.2	.0	.0
Providence	160	218	251	29.84	30.01	+.02	71.3	+.3	93	14	80	52	25	62	27	64	60	68	1.14	−2.4	6	7,088	nw.	25	nw.	5	17	8	6	3.6	.0	.0
Hartford	159	70	104	29.83	30.00	+.01	71.7	+2.8	91	16	81	50	31	62	27				.93	−3.4	6	5,285	s.	26	w.	13	15	10	6	4.4	.0	.0
New Haven	106	74	153	29.91	30.02	+.05	71.7	+1.4	90	1	80	51	31	64	25	65	61	71	.72	−3.5	5	5,880	n.	21	s.	26	9	15	7	5.2	.0	.0
Middle Atlantic States							74.3	+0.7										73	2.80	−1.5										5.9		
Albany	972	97	112	29.91	30.01	+.02	71.6	+.8	91	17	81	51	25	62	27	64	60	70	1.47	−2.2	10	5,110	s.	21	s.	11	12	11	8	4.6	.0	.0
Binghamton	871	66	68	29.11	30.03	+.04	68.5	+.6	90	17	79	43	25	58	30				3.21	−.4	13	3,645	e.	25	nw.	1	6	6	19	6.8	.0	.0
New York	314	415	454	29.69	30.01	+.01	73.6	+.5	90	2	81	55	31	66	29	65	62	73	1.43	−2.9	7	8,145	n.	40	n.	13	8	13	10	5.5	.0	.0
Harrisburg	374	94	104	29.62	30.00	−.01	73.8	+1.2	94	1	82	53	29	66	28	65	61	70	2.37	−1.7	9	4,801	w.	19	ne.	15	6	13	12	6.2	.0	.0
Philadelphia	114	168	367	29.91	30.03	+.03	75.3	+.5	95	13	83	56	25	68	22	66	62	71	3.34	−1.3	10	7,413	e.	34	n.	1	7	10	14	6.3	.0	.0
Reading	323	283	306	29.67	30.02		72.8	+.4	94	13	81	53	31	65	24	65	61	71	1.44	−2.8	14	6,707	se.	39	n.	1	7	12	12	6.1	.0	.0
Scranton	805	72	104	29.18	30.03	+.03	70.8	+1.0	92	13	80	48	25	61	2	63	59	71	4.95	+1.3	14	3,852	n.	29	nw.	13	7	14	10	5.8	.0	.0
Atlantic City	52	37	172	29.96	30.01	+.01	74.0	+1.5	91	2	80	56	25	69	22	68	66	78	2.31	−2.2	7	9,963	e.	41	nw.	14	7	10	14	6.5	.0	.0
Sandy Hook	22	10	57	29.99	30.01		73.6		90	1	79	58	31	68	19	67	64	77	2.63	−2.4	7	7,918	s.	29	n.	24	11	9	11	5.4	.0	.0
Trenton	190	38	106	29.82	30.02		73.4	+.4	93	1	82	54	25	65	26	66	62	73	3.09	−1.7	11	5,604	n.	30	s.	15	8	13	10	5.9	.0	.0
Baltimore	123	100	215	29.89	30.01	.00	76.8	+1.3	95	1	84	56	25	69	24	68	63	68	3.97	−.4	11	7,173	sw.	42	sw.	13	5	17	9	5.9	.0	.0
Washington	112	62	85	29.89	30.01	.00	76.8	+1.8	98	13	85	54	25	68	27	68	64	70	2.40	−1.6	10	4,521	nw.	17	se.	19	4	16	11	6.2	.0	.0
Cape Henry	18	8	54	30.00	30.02		77.1	+.2	97	2	83	62	26	71	23	71	69	78	2.08	−2.8	10	8,023	sw.	30	nw.	2	14	12	5	4.8	.0	.0
Lynchburg	686	5		29.30	30.03	+.01	76.8	+1.2	100	3	88	50	31	66	38				3.80	.0	20		ne.				3	20	8		.0	.0
Norfolk	91	80	125	29.92	30.01	+.01	77.4	.0	96	3	84	63	31	71	22	71	68	78	3.63	−1.6	11	6,306	e.	38	nw.	2	5	10	16	6.6	.0	.0
Richmond	144	11	52	29.87	30.02	+.01	76.2	−.3	96	13	85	57	25	68	27	69	66	78	3.68	−.7	10	5,147	sw.	34	nw.	2	8	14	9	5.6	.0	.0
Wytheville	2,304	49	55																													
South Atlantic States							79.3	+1.2										79	7.36	+1.7										5.8		
Asheville	2,253	89	104	27.74	30.01	−.01	74.0	+3.5	95	7	84	51	31	64	32	66	64	79	3.05	−1.1	14	5,029	se.	28	nw.	7	10	12	9	5.5	.0	.0
Charlotte	779	63	86	29.20	30.01	−.01	78.8	+1.7	99	7	88	58	30	69	27	70	66	73	2.70	−2.4	10	4,742	ne.	20	ne.	7	6	13	12	6.0	.0	.0
Greensboro	886	6	56	29.08	30.02		76.3		96	3	87	52	31	66	35	69	66	78	1.90		11	5,174	ne.	32	n.	7	8	12	11	5.8	.0	.0
Hatteras	11	5	50	29.99	30.00	.00	78.2	+.2	91	5	83	64	26	73	17	75	74	87	8.78	+3.0	13	8,054	sw.	48	nw.	7	13	8	10	5.3	.0	.0
Raleigh	376	103	146	29.60	29.99	−.02	77.9	+.9	99	3	87	58	31	69	27	70	67	76	5.91	+.5	9	5,652	ne.	44	nw.	7	13	11	7	4.7	.0	.0
Wilmington	72	73	107	29.92	30.00	.00	78.8	+1.2	97	4	86	63	31	72	24	73	71	83	10.02	+3.7	13	5,601	ne.	30	sw.	29	9	11	11	5.7	.0	.0
Charleston	48	11	92	29.95	30.00	−.01	81.2	+.2	98	4	87	70	18	75	19	75	73	82	9.53	+3.0	12	7,105	sw.	41	se.	18	1	18	12	6.8	.0	.0
Columbia, S. C	347	67	73	29.64	30.01	.00	80.0	+.4	101	4	89	62	30	71	27	72	69	75	10.26	+4.8	11	4,518	ne.	21	nw.	8	9	15	7	5.2	.0	.0
Greenville, S. C	1,039	139					77.7	+1.9	97	5	87	57	30	68	27				6.29	+.8	10		ne.				11	8	12		.0	.0
Augusta	182	62	77	29.79	29.98	−.03	81.4	+1.0	101	4	90	63	26	72	26	73	70	74	7.18	+2.2	10	4,266	s.	15	ne.	17	5	19	7	5.8	.0	.0
Savannah	65	73	152	29.92	29.99	−.02	82.1	+1.4	99	4	90	70	30	74	22	75	73	83	8.15	+.8	15	6,510	s.	27	se.	18	5	15	11	6.4	.0	.0
Jacksonville	43	86	110	29.94	30.00	−.01	82.6	+.9	98	4	90	72	21	75	20	75	74	83	9.07	+3.3	15	4,864	s.	24	sw.	30	4	9	18	6.9	.0	.0
Florida Peninsula							83.2	+1.1										77	7.42	+1.1										5.2		
Key West	22	10	64	29.95	29.97	−.01	84.0	+.5	91	7	90	73	23	79	17	77	74	74	4.18	−.3	14	6,067	e.	23	sw.	23	7	21	4	5.0	.0	.0
Miami	25	124	168	29.97	30.00	−.02	83.0	+1.6	92	6	89	72	23	77	18	76	73	74	6.36	+.2	14	5,606	se.	24	s.	23	5	22	4	5.3	.0	.0
Tampa	35	88	197	29.95	29.98	−.02	82.6	+1.1	94	6	90	69	31	75	24	76	74	84	11.72	+3.5	16	6,003	se.	29	se.	12	6	21	4	5.4	.0	.0
Titusville	43	5	36																													
East Gulf States							81.7	+1.8										78	7.10	+1.8										5.6		
Atlanta[1]	976	6	53	28.98	29.97	−.04	79.8	+2.8	110	7	89	60	26	70	30	71	69	78	3.37	−1.1	12	4,912	ne.	43	ne.	11	6	12	13	6.5	.0	.0
Macon	370	79	87	29.60	29.96	−.02	80.8	+.9	98	4	90	65	31	72	24	73	70	77	3.94	−.4	10	4,489	s.	24	s.	14	10	13	8	5.3	.0	.0
Thomasville	273	49	58	29.71	30.00	.00	80.8	−.2	98	5	90	69	4	72	27	75	74	90	10.34	+4.6	21		e.				1	17	13		.0	.0
Apalachicola	33	11	51	29.93	29.97		82.1		95	5	88	72	28	76	18	76			18.93	+11.4	16		sw.				3	13	15		.0	.0
Pensacola	56	149	185	29.90	29.96	−.02	80.8	−.1	96	5	86	70	12	75	19	75	73	81	21.43	+13.4	18	7,792	s.	38	ne.	9	9	15	7	5.6	.0	.0
Anniston	741	9					80.4	+4.0	102	7	90	57	31	70	29				5.79	+1.7	14		se.				11	13	7		.0	.0
Birmingham	709	11	48	29.22	29.97	−.02	82.2	+3.0	104	8	93	58	29	72	32	71	68	74	3.41	−.8	13	4,326	e.	19	se.	23	10	14	7	5.2	.0	.0
Mobile	57	125	161	29.89	29.95	−.03	82.0	+1.0	100	6	89	68	30	75	25	75	73	80	3.24	−3.7	15	5,970	s.	28	se.	6	8	13	10	6.4	.0	.0
Montgomery	218	92	105	29.73	29.98	−.01	82.0	+1.2	100	5	90	67	29	74	23	74	72	80	4.83	+.6	15	4,614	s.	24	ne.	4	7	13	11	6.2	.0	.0
Meridian	378	67	92	29.58	29.96	−.02	82.8	+3.3	106	8	92	59	29	72	30	73	69	74	3.32	−1.2	10	3,881	sw.	22	ne.	5	10	16	5	4.6	.0	.0
Vicksburg	247	65	73	29.71	29.96	−.02	82.6	+1.8	100	9	92	63	31	73	30	73	70	74	1.76	−1.7	7	4,649	n.	37	ne.	11	14	11	6	4.6	.0	.0
New Orleans	53	76	84	29.96	29.93	−.03	84.2	+2.0	97	8	91	74	6	77	23	76	74	77	4.80	−1.0	20	4,148	sw.	27	ne.	6	4	19	8	6.0	.0	.0
West Gulf States							84.1	+2.2										71	1.79	−1.4										3.7		
Shreveport	249	92	227	29.69	29.97	−.02	84.8	+2.8	106	9	95	63	30	75	26	73	69	67	2.70	.0	6	6,250	sw.	29	n.	29	19	9	3	3.5	.0	.0
Bentonville	1,303	11	44	28.64	29.96	−.01	80.2	+3.7	105	9	92	54	31	69	34				1.31		4	4,861	se.	18	se.	19	10	13	8		.0	.0
Fort Smith	457	79	94	29.46	29.95	−.04	84.6	+4.1	108	11	96	56	29	73	31	71	66	60	1.60	−1.7	7	5,070	e.	20	e.	12	15	13	3	3.7	.0	.0
Little Rock	357	94	102	29.60	29.97	−.01	82.2	+2.4	103	7	92	56	29	72	27	71	67	66	2.07	−1.7	6	5,398	e.	21	n.	12	18	7	6	3.8	.0	.0
Austin	605	136	148	29.30	29.93		85.6	+1.2	102	10	96	66	30	74	29	73	68	60	.24	−1.8	5	5,106	se.	22	se.	3	18	11	2	3.3	.0	.0
Brownsville	57	88	96	29.84	29.96		84.2	+.3	96	25	92	72	27	77	20	76	74	80	1.14	−1.4	9	6,715	se.	25	se.	27	12	13	3	4.1	.0	.0
Corpus Christi	20	11	78	29.90	29.92	−.01	84.6	+2.1	94	25	91	75	8	78	18	77	75	80	.43	−1.8	2	7,677	s.	25	s.	2	10	14	1	3.5	.0	.0
Dallas	512	220	227	29.38	29.91		84.6		105	10	94	63	30	75	25	73	69	66	.26	−2.5	2	7,201	se.	38	ne.	21	19	8	4	3.0	.0	.0
Fort Worth	679	92	110	29.24	29.94	.00	85.7	+2.7	106	10	96	64	30	75	29				.70	−1.9	4	6,401	s.	2	se.	21	23	7	1	1.7	.0	.0
Galveston	54	106	114	29.89	29.95	−.01	84.8	+1.8	98	9	90	74	27	80	18	77	74	75	3.61	−.7	7	6,492	s.	24	s.	2	13	14	4	4.1	.0	.0
Houston	138	292	314	29.81	29.95		84.4	+1.2	100	9	93	69	31	76	25				1.68	−2.5	11	6,739	s.	38	e.	10	9	19	3	4.8	.0	.0
Palestine	510	64	72	29.44	29.95	−.02	84.1	+2.3	104	10	95	63	30	73	28	73	69	71	1.90	−.3	8	4,755	s.	21	se.	14	10	14	1	3.5	.0	.0
Port Arthur	34	58	66	29.91	29.95		84.0		102	9	92	68	30	76	24	76	74	77	5.94	−.1	11	4,802	s.	20	ne.	21	10	18	3	4.9	.0	.0
San Antonio	693	242	301	29.21	29.90	−.03	84.9	+1.4	101	24	96	68	31	74	30	74	70	68	.98	−1.4	3	7,648	e.	35	e.	3	12	18	1	4.0	.0	.0

[1] Observations taken at airport.

TABLE 1.—*Climatological data for Weather Bureau stations, August 1935*—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max. + mean min. ÷2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01, or more	Wind: Total movement	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
Ohio Valley and Tennessee	Ft.	Ft.	Ft.	In.	In.	In	°F.	°F.	°F.		°F.	°F.		°F.	°F.	°F.	°F.	%	In.	In.		Miles								0-10	In.	In.
							76.6	+1.6										73	4.34	+0.9										5.2		
Chattanooga	762	71	214	29.19	29.98	−0.02	81.2	+3.7	104	7	91	59	31	71	29	71	67	68	6.47	+2.4	9	4,872	ne.	28	w.	10	13	11	7	4.5	0.0	0.0
Knoxville	995	66	84	28.96	29.99	−.02	79.4	+3.2	101	7	90	56	31	66	30	70	67	73	2.60	−1.3	13	3,857	ne.	22	ne.	7	18	8	5	4.0	.0	.0
Memphis	399	78	86	29.54	29.96	−.02	81.8	+2.4	99	11	90	59	31	74	24	72	67	65	.76	−2.6	4	5,189	sw.	22	n.	17	20	7	4	3.5	.0	.0
Nashville	546	168	191	29.42	30.00	.00	80.0	+2.2	102	7	89	56	31	71	27	71	67	72	2.29	−1.4	6	5,564	se.	31	nw.	12	9	14	8	5.1	.0	.0
Lexington	989	6																														
Louisville	525	188	234	29.43	30.01	+.01	77.2	+.2	94	1	86	52	31	69	28	69	66	72	3.68	+.3	8	6,389	n.	32	nw.	7	14	9	8	4.9	.0	.0
Evansville	431	76	116	29.52	29.98	−.01	79.1	+1.7	100	1	88	53	31	70	25	70	66	70	2.26	−1.1	8	5,089	sw.	31	n.	7	11	14	6	5.0	.0	.0
Indianapolis	822	194	230	29.13	30.00	.00	75.6	+1.9	96	1	84	51	31	67	29	66	62	68	4.99	+1.7	8	6,535	sw.	30	w.	13	6	13	12	6.0	.0	.0
Terre Haute	575	96	129	29.37	29.97		77.4		100	1	88	51	31	67	30	68	65	72	3.13	−.1	7	5,476	sw.	37	w.	12	11	12	8	4.7	.0	.0
Cincinnati	627	11	51	29.34	30.00	−.01	75.5	+1.9	97	12	85	46	31	66	34	68	65	78	4.56	+1.2	10	4,508	sw.	18	ne.	3	7	13	11	6.0	.0	.0
Columbus	822	90	210	29.14	30.00	−.01	74.4	+1.4	95	2	84	47	31	65	27	67	64	74	6.61	+3.4	12	5,914	s.	37	sw.	13	9	13	9	5.6	.0	.0
Dayton	900	58	153	29.05	29.90		75.2	+1.8	96	1	84	47	31	66	31				2.47	−.8	10	5,440	sw.	40	w.	13	7	14	10		.0	.0
Elkins	1,947	59	78	28.05	30.04	+.02	70.0	+.9	90	12	80	44	29	60	33	64	62	85	5.61	+1.8	15	3,560	se.	29	nw.	10	3	16	12	6.4	.0	.0
Parkersburg	637	77	84	29.39	30.04	+.03	74.2	+.3	94	1	84	48	29	64	30	68	66	81	10.42	+6.9	14	3,866	se.	28	nw.	1	6	17	8	5.9	.0	.0
Pittsburgh [1]	842	164	410	28.68	30.02	+.01	72.0	−.9	91	12	81	46	31	63	27	64	61	76	4.92	+1.7	11	6,492	sw.	42	s.	15	5	13	13	6.4	.3	.0
Lower Lake Region							71.2	+1.6										73	2.74	−0.3										5.6		
Buffalo	768	243	280	29.18	30.00	+.01	70.2	+1.6	92	16	77	51	31	63	27	64	60	73	.76	−2.3	7	8,564	sw.	50	sw.	12	11	11	9	5.3	.0	.0
Canton	448	10	61	29.51	29.97		68.3	+.5	92	18	79	41	24	58	33				2.87	−.8	9	5,074	sw.	22	w.	1	11	14	6	4.6	.0	.0
Ithaca	836	77	100	29.13	30.02		69.2	+.6	93	16	80	43	25	59	32	63	59	76	2.60	−.8	11	5,182	nw.	22	n.	1	4	18	9	5.8	.0	.0
Oswego	335	71	85	29.64	30.00	+.01	69.7	+1.3	90	12	77	50	31	62	27	63	59	70	1.47	−1.1	8	5,837	s.	25	n.	21	9	10	12	5.5	.0	.0
Rochester	523	86	102	29.46	30.02	+.03	70.3	+1.1	92	12	78	47	31	62	25	62	58	67	2.75	−.1	8	4,992	sw.	22	w.	28	9	14	8	5.2	.0	.0
Syracuse	596	65	79	29.39	30.02	+.03	71.0	+2.4	91	18	79	49	31	62	26				2.59	−.3	9	4,828	s.	18	nw.	5	10	15	6	5.1	.0	.0
Erie	714	130	166	29.25	30.00	−.01	71.8	+2.2	93	12	79	51	31	65	23	65	62	75	2.02	−1.2	11	8,314	se.	31	w.	1	11	11	9	5.2	.0	.0
Cleveland	762	267	318	29.19	30.00	−.01	72.0	+2.0	92	12	78	51	31	66	21	65	62	72	5.70	+2.9	11	9,137	se.	46	w.	1	6	14	11	6.1	.0	.0
Sandusky	629	5	67	29.33	30.00	−.01	73.4	+1.6	98	1	82	46	31	65	26				2.76	−.4	15	5,387	sw.	30	nw.	1	5	11	15	6.4	.0	.0
Toledo	628	75	87	29.34	30 01	+.01	72.6	+1.3	98	1	81	48	31	64	29	66	63	76	3.85	+1.0	11	5,724	se.	32	w.	1	9	12	10	5.4	.0	.0
Fort Wayne	857	69	84	29.09	30.00		73.8	+2.7	96	12	83	48	29	65	27	66	62	71	2.39	−.7	14	5,628	nw.	25	sw.	2	5	16	10	5.7	.0	.0
Detroit [1]	626	5	78	29.33	30.00	−.01	71.6	+1.3	96	1	80	46	29	63	27	65	62	76	3.10	+.3	8	5,958	se.	29	nw.	27	6	12	13	6.5	.0	.0
Upper Lake Region							68.3	+2.0										78	3.06	+0.2										5.7		
Alpena	609	13	89	29.35	30.01	+.01	66.4	+2.3	86	12	74	44	31	58	25	62	60	80	2.07	−.8	12	7,324	se.	32	se.	6	13	10	8	4.8	.0	.0
Escanaba	612	54	60	29.33	29.99	.00	65.4	+1.1	82	16	73	39	29	58	23	61	58	79	1.86	−1.3	14	6,670	s.	27	nw.	27	6	13	12	6.0	.0	.0
Grand Rapids	707	70	244	29.23	29.98	−.02	72.2	+2.5	93	1	81	50	29	63	25	65	61	74	2.22	−.4	9	6,296	w.	37	nw.	27	9	14	8	5.4	.0	.0
Lansing	878	6	88	29.07	30.00		69.2	+.7	91	1	78	42	29	60	26	65	63	85	2.69	−.1	9	5,326	w.	25	nw.	27	8	9	14	6.1	.0	.0
Ludington	637	5	54	29.30	29.99		69.2	+39	85	15	76	47	22	62	28	64			3.20	+.6	9		se.				8	12	11		.0	.0
Marquette	734	77	111	29.17	29.97	−.01	66.0	+2.2	87	19	73	44	29	59	22	61	58	77	2.35	−.3	13	6,728	w.	31	sw.	11	5	15	11	6.2	.0	.0
Sault Ste. Marie	614	11	52	29.31	30.00	+.01	64.6	+2.5	88	16	73	40	30	56	27	59	57	79	2.65	.0	11	5,501	se.	22	nw.	28	7	13	11	5.9	.0	.0
Chicago	673	7	131	29.28	30.00	.00	73.4	+1.8	93	1	80	50	28	66	25	66	63	73	3.56	+.4	13	6,328	w.	24	sw.	2	8	14	9	5.4	.0	.0
Green Bay	617	109	141	29.32	29.98	−.01	69.4	+1.7	91	11	78	42	29	61	25	63	59	74	4.31	+1.1	11	6,548	w.	35	nw.	27	5	8	18	6.6	.0	.0
Milwaukee	681	97	221	29.26	29.99	−.01	71.6	+2.4	93	11	78	49	29	65	21	65	62	75	3.08	+.4	9	7,642	w.	29	nw.	27	11	11	9	5.3	.0	.0
Duluth	1,133	5	47	28.74	29.94	−.03	63.9	+1.3	87	19	72	39	31	56	27	59	57	84	5.65	+2.5	15	8,010	ne.	38	nw.	27	9	10	12	5.7	.0	.0
North Dakota							66.8	+0.8										63	2.84	+0.6										4.3		
Moorhead, Minn	940	50	58	28.91	29.90	−.06	68.6	+2.5	102	15	80	39	28	57	38	60	54	64	4.59	+1.7	13	6,702	s.	27	w.	11	12	11	8	4.9	.0	.0
Bismarck	1,674	8	57	28.15	29.90	−.04	68.0	+.7	104	14	82	33	28	54	45	57	49	58	1.14	−.7	10	6,946	nw.	30	nw.	15	14	13	4	4.1	.0	.0
Devils Lake	1,478	11	44	28.37	29.92	−.02	64.0	−.8	97	14	75	37	31	53	36	57	53	75	4.52	+2.0	15	6,319	se.	34	nw.	11	13	10	8	4.9	.0	.0
Grand Forks	833	12	67				65.6		98	14	77	32	31	54	38	59			5.32		14		nw.	32	w.	8	8	16	7		.0	.0
Williston	1,878	41	48	27.96	29.91	−.02	66.8	+.7	103	10	80	37	30	54	42	54	45	54	1.06	−.4	7	6,260	nw.	30	w.	23	19	9	3	3.4	.0	.0
Upper Mississippi Valley							74.7	+1.8										72	3.22	0.0										4.4		
Minneapolis	918	102	208	28.98	29.94		72.6	+2.7	95	11	82	45	28	63	27	63	58	65	3.02	−.1	11	7,525	s.	32	nw.	27	12	13	6	5.0	.0	.0
La Crosse	714	11	48	29.20	29.95	−.03	70.9	+.9	92	11	81	42	29	61	29	65	62	79	7.53	+3.8	11	3,127	s.	15	w.	27	11	11	9	5.1	.0	.0
Madison	974	70	78	28.95	29.97	−.02	71.2	+1.4	89	11	79	47	28	63	26	65	62	77	4.22	+1.0	11	4,995	se.	21	s.	6	8	13	10	5.5	.0	.0
Charles City	1,015	10	51	28.91	29.96	−.01	71.4	+2.3	93	11	82	40	28	60	31	64	61	74	4.29	+.8	11	4,457	se.	24	sw.	8	17	10	4	3.4	.0	.0
Davenport	606	66	161	29.34	29.99	+.01	75.6	+2.5	95	6	85	47	28	66	24	67	63	71	1.51	−2.0	8	5,892	sw.	26	nw.	2	11	11	9	4.7	.0	.0
Des Moines	861	5	99	29.07	29.96	−.01	75.0	+1.9	98	9	85	46	28	65	28	66	62	70	1.87	−1.7	5	5,816	se.	28	sw.	9	14	11	6	3.9	.0	.0
Dubuque	700	60	79	29.24	29.97	−.01	73.1	+1.4	93	11	83	46	29	64	27	65	62	73	4.62	+1.4	8	3,746	s.	21	nw.	27	12	10	9	4.8	.0	.0
Keokuk	614	64	78	29.33	29.99	+.01	75.8	+.8	95	6	85	50	28	67	26	68	64	70	1.96	−1.3	9	4,425	s.	29	n.	9	16	9	6	3.9	.0	.0
Cairo	358	87	93	29.59	29.96	−.03	79.6	+1.8	98	11	88	58	31	72	25	72	69	76	5.96	+3.0	5	4,953	n.	22	nw.	12	9	13	9	5.4	.0	.0
Peoria	606	11	45	29.35	30.01	+.02	74.8	+2.3	96	11	85	44	28	64	29	67	65	77	.98	−2.1	7	3,842	s.	15	nw.	2	17	12	2	3.2	.0	.0
Springfield, Ill	636	5	191	29.32	29.98	−.01	77.4	+2.9	100	6	87	52	30	68	27	68	64	69	1.23	−1.9	3	6,537	s.	26	nw.	9	13	11	7	4.4	.0	.0
St. Louis	568	265	303	29.38	29.97	−.02	78.6	+1.3	98	1	87	56	30	70	28	69	66	69	1.82	−1.2	6	7,051	s.	27	sw.	2	13	13	5	4.0	.0	.0
Missouri Valley							77.2	+2.9										63	2.66	−0.7										3.8		
Columbia, Mo	784	6	84	29.15	29.96	−.01	77.6	+2.0	100	11	88	54	30	67	32				.27	−3.3	4	4,848	sw.	18	s.	19	15	12	4	3.9	.0	.0
Kansas City [1]	750	32	45	29.16	29.94	−.03	80.3	+3.7	104	9	91	52	28	70	32	68	63	62	2.25	−1.8	9	6,224	sw.	28	nw.	2	14	10	7	4.2	.0	.0
St. Joseph	967	11	49	28.94	29.94		78.4		104	9	89	52	30	68	31	67	62	64	1.57	−1.9	10	5,441	se.	51	nw.	2	15	9	7	3.7	.0	.0
Springfield, Mo	1,324	98	104	28.60	29.97	.00	78.6	+2.9	102	11	88	53	29	69	32	68	63	65	3.93	−.2	5	6,099	s.	30	nw.	12	20	8	3	3.1	.0	.0
Iola	984	11	50	28.93	29.94	−.02	80.4	+3.3	102	11	92	52	30	68	33				5.49	+2.0	8		s.				15	10	6		.0	.0
Topeka	987	65	87				80.0	+3.8	108	11	92	51	30	68	37				3.98	−.1	13	6,160	s.	25	nw.	9	14	11	6	4.1	.0	.0
Lincoln	1,189	11	81	28.69	29.92	−.03	78.6	+4.2	106	8	90	48	30	67	33	66	60	61	1.70	−1.9	10	6,766	s.	24	nw.	19	12	14	5	4.4	.0	.0
Omaha [1]	1,105	170	200	28.91	29.94	−.02	76.7	+2.3	103	11	88	50	30	66	35	68	64	72	2.15	−.9	10	6,908	se.	26	se.	19	15	10	6	4.0	.0	.0
Valentine	2,598	47	54	27.28	29.94	.00	72.0	+.3	104	10	86	34	30	58	44	59	52	55	.44	−1.7	6	7,284	s.	28	sw.	4	19	7	5	3.5	.0	.0
Sioux City	1,138	64	106	28.73	29.91	−.04	75.7	+3.7	101	11	86	42	28	63	33	66	61	65	2.00	−1.1	9	6,808	se.	27	se.	22	11	15	5	4.4	.0	.0
Huron	1,306	60	74	28.55	29.92	−.03	72.2	+2.8	102	14	85	38	28	59	42	61	55	62	5.42	+3.0	13	6,945	se.	33	sw.	7	20	9	2	3.2	.0	.0
Northern Slope							67.6	+1.3										45	0.88	−0.3										3.7		
Billings	3,570	17	31																													
Havre	2,505	11	67	27.33	29.92	+.01	65.8	+.4	99	13	81	38	29	50	48	50	37	44	.33	−.9	5	6,203	e.	34	nw.	10	14	13	4	3.6	.0	.0
Helena	4,124	85	111	25.80	29.91	−.03	66.4	+1.4	94	13	80	44	20	53	42	50	35	36	.62	−.2	4	6,553	sw.	31	nw.	10	16	9	6	3.7	.0	.0
Kalispell	2,973	48	56	26.93	29.93	.00	62.2	−.6	92	13	77	40	20	47	44	50		50	.37	−.5	2	4,974	w.	23	sw.	23	18	9	4	3.1	.0	.0
Miles City	2,371	48	55	27.43	29.93	.00	71.0	−.5	107	10	84	45	30	58	42	54	41	42	1.87	+.8	4	5,090	ne.	31	nw.	11	16	10	5	3.7	.0	.0
Rapid City	3,259	50	58	26.61	29.94	+.01	71.0	+1.5	106	14	85	41	30	[57	44	56	43	41	.19	−1.5	5	6,052	w.	30	nw.	11	14	11	6	3.8	.0	.0
Cheyenne	6,094	50	71	24.10	29.92	.00	67.8	+2.2	93	14	82	44	12	[54	40	53	43	49	.60	−1.0	6	6,559	s.	25	w.	1	10	16	5	4.8	.0	.0
Lander	5,372	60	68	24.69	29.90	−.02	68.0	+2.5	95	10	84	44	2	52	43	51	37	40	.35	−.2	3	3,990	sw.	30	sw.	17	20	7	4	3.4	.0	.0
Sheridan	3,790	10	47	26.09	29.92		67.4		105	10	85	38	20	49	55	52	41	49	1.90	+1.0	4	3,828	nw.	19	ne.	16	18	7	6	3.1	.0	.0
Yellowstone Park	6,241	11	48	23.96	29.93	.00	61.2	+.3	88	10	77	39	26	46	41	46	32	41	.72	−.4	4	6,296	sw.	27	sw.	14	18	9	4	3.3	.0	.0
North Platte	2,821	11	51	27.06	29.92	−.02	75.0	+4.2	103	8	88	45	30	62	39	63	55	60	1.89	−.5	11	5,450	se.	28	nw.	6	12	14	5	4.3	.0	.0

[1] Observations taken at airport.

TABLE 1.—*Climatological data for Weather Bureau stations, August 1935*—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max. +2 mean min. +2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01, or more	Wind: Total movement	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
	Ft.	Ft.	Ft.	In.	In.	In.	°F.	°F.	°F		°F	°F.		°F	°F.	°F.	°F.	%	In.	In.		Miles								0–10	In.	In.
Middle Slope							79.2	+3.3										54	2.37	−0.1										4.4		
Denver	5,292	106	113	24.79	29.92	0.00	73.6	+2.9	97	15	85	55	30	62	30	58	48	51	1.30	−0.1	11	5,703	s.	32	n.	15	8	20	3	4.9	0.0	0.0
Pueblo	4,685	80	86	25.32	29.88	−.03	75.8	+3.1	98	15	89	56	31	63	38	59	50	50	1.08	−.7	10	5,150	nw.	23	sw.	4	10	16	5	4.5	.0	.0
Concordia	1,392	50	58	28.50	29.93	−.02	79.5	+3.0	108	11	91	48	30	68	35	66	59	59	5.83	+2.9	11	6,070	s.	24	ne.	11	13	10	8	4.6	.0	.0
Dodge City	2,509	10	86	27.39	29.91	−.02	80.2	+2.5	105	1	93	51	30	68	39	65	57	54	1.62	−1.0	6	9,102	s.	29	s.	4	19	10	2	3.1	.0	.0
Wichita	1,358	85	93	28.51	29.90	−.05	82.0	+3.7	105	11	93	52	29	71	28	67	59	52	1.55	−1.6	7	7,931	sw.	26	sw.	5	15	9	7	4.1	.0	.0
Oklahoma City	1,214	10	47	28.68	29.92	−.02	84.2	+4.5	105	11	95	58	30	73	29	70	64	60	2.82	−.1	5	6,150	s.	21	s.	1	12	9	10	4.9	.0	.0
Southern Slope							82.1	+2.4										57	1.78	−0.2										3.8		
Abilene	1,738	10	52	28.14	29.90	−.02	84.9	+2.9	105	10	96	64	30	73	29	69	62	55	.37	−1.9	3	6,993	s.	24	s.	2	17	9	5	3.3	.0	.0
Amarillo	3,676	10	49	26.29	29.92	.00	79.2	+3.5	100	1	90	57	30	68	28	64	58	59	5.32	+2.2	10	6,265	s.	28	ne.	28	9	16	6	4.7	.0	.0
Del Rio	944	64	71	28.88	29.84	−.06	85.4	+1.2	101	25	95	72	31	76	26	71	65	57	.10	−1.6	1	7,399	se.	24	se.	3	20	10	1	2.9	.0	.0
Roswell	3,566	75	85	26.37	29.89	+.01	78.8	+2.2	99	1	91	61	31	67	32	64	57	57	1.33	−.8	8	5,110	s.	41	se.	22	12	13	6	4.5	.0	.0
Southern Plateau							78.2	+0.9										58	1.66	+0.4										4.5		
El Paso	3,778	152	175	26.16	29.83	−.01	81.6	+2.4	96	11	92	64	30	71	26	65	58	52	1.72	.0	8	5,999	e.	37	n.	10	16	13	2	3.9	.0	.0
Albuquerque	4,972	5	30	25.09	29.84	------	74.6	------	93	8	87	59	6	62	32	61	55	65	3.74	+2.2	14	5,416	se.	40	w.	23	6	18	7	5.4	.0	.0
Santa Fe	7,013	38	53	23.37	29.89	.00	67.6	+.2	85	14	79	52	10	57	29	56	50	63	2.03	−.2	17	4,237	e.	21	sw.	15	5	19	7	5.8	.0	.0
Flagstaff	6,907	10	59	23.45	29.86	+.02	64.6	+1.8	85	11	78	42	17	51	38	54	----	69	4.01	------	18	------	nw.	23	nw.	8	2	14	15	----	.0	.0
Phoenix	1,108	10	107	28.66	29.78	−.01	88.4	−.1	109	20	100	71	24	77	33	71	63	50	1.27	+.3	8	4,182	e.	30	e.	6	13	12	6	4.3	.0	.0
Yuma	141	9	54	29.62	29.76	.00	90.6	+.2	114	21	102	71	17	79	34	75	68	53	.59	−.1	4	4,568	s.	22	nw.	22	21	9	1	2.7	.0	.0
Independence	3,957	5	26	25.94	29.85	+.04	76.8	+.7	100	11	93	53	18	60	41	54	----	----	.20	+.1	2	------	s.	----	----	----	18	9	4	----	.0	.0
Middle Plateau							73.4	+2.3										37	0.61	−0.1										2.9		
Reno	4,527	61	76	25.46	29.80	+.02	72.2	+5.2	99	9	90	42	1	55	44	52	37	37	.04	−.2	1	5,024	w.	28	w.	16	27	3	1	1.0	.0	.0
Tonopah	6,090	12	20	------	------	------	73.8	------	91	15	85	58	1	62	29	53	34	29	T	------	0	------	------	------	------	------	------	------	------	------	------	------
Winnemucca	4,344	18	59	25.60	29.90	+.02	71.6	+2.3	102	9	92	43	13	51	57	50	31	28	.01	−.2	1	5,149	sw.	19	nw.	14	26	4	1	1.2	.0	.0
Modena	5,472	10	40	24.64	29.84	−.02	71.0	+1.8	93	11	86	40	13	56	46	52	44	43	1.06	−.2	4	7,040	sw.	30	sw.	10	16	10	5	4.0	.0	.0
Salt Lake City [1]	4,537	86	210	25.70	29.84	−.07	75.6	+1.1	101	10	91	47	2	61	40	57	44	39	.80	.0	6	7,337	se.	53	w.	16	17	10	4	3.6	.0	.0
Grand Junction	4,602	60	68	25.38	29.89	−.01	76.6	+1.2	96	13	90	56	3	64	36	58	49	43	1.15	.0	10	4,796	se.	28	se.	9	11	12	8	4.8	.0	.0
Northern Plateau							70.0	+0.7										37	0.26	−0.3										2.0		
Baker	3,471	48	53	26.45	29.98	+.03	65.4	+.8	100	9	83	35	16	48	49	50	35	38	.12	−.4	2	4,356	n.	17	n.	13	25	3	3	2.1	.0	.0
Boise	2,739	70	87	27.11	29.90	−.03	72.2	+.4	102	9	88	43	16	56	44	53	37	32	T	−.2	0	3,877	nw.	13	nw.	14	26	3	2	1.3	.0	.0
Pocatello	4,477	60	68	25.46	29.87	−.05	72.0	+2.4	97	13	87	48	20	57	42	51	32	27	.28	−.4	5	6,491	se.	28	sw.	4	22	7	2	2.0	.0	.0
Spokane	1,929	101	110	27.93	29.94	−.01	67.4	−.7	95	9	82	41	16	53	41	52	40	44	.96	+.3	2	4,368	s.	23	sw.	14	21	7	3	2.9	.0	.6
Walla Walla	991	57	65	28.88	29.93	−.03	72.7	.0	98	9	86	50	15	56	38	56	40	36	.19	−.3	2	4,138	w.	21	w.	10	25	4	2	1.8	.0	.0
Yakima	1,076	58	67	28.82	29.96	------	70.6	+1.1	96	9	85	46	15	56	39	56	44	46	.01	−.2	1	4,717	nw.	21	nw.	23	25	4	2	1.9	.0	.0
North Pacific Coast Region							62.9	+0.8										68	0.84	0.0										3.9		
North Head	211	11	56	29.84	30.06	+.03	57.0	−.6	84	26	61	48	20	53	33	54	53	89	.85	−.2	8	9,281	n.	41	s.	17	11	12	8	5.4	.0	.0
Seattle	125	90	321	29.89	30.02	+.02	64.7	+1.6	89	28	74	51	16	56	29	57	51	65	.56	−.2	5	5,408	n.	23	ne.	14	14	8	9	4.4	.0	.0
Tatoosh Island	86	10	54	29.97	30.06	+.06	54.9	−.4	69	28	58	47	11	51	17	53	52	91	2.84	+.8	5	6,720	sw.	32	e.	26	7	3	21	7.0	.0	.0
Medford	1,329	29	58	28.54	29.91	------	72.6	------	107	12	91	43	16	54	52	57	46	49	.31	+.1	2	4,492	nw.	24	sw.	28	27	3	1	1.1	.0	.0
Portland, Oreg	153	68	106	29.84	30.00	−.01	68.4	+1.7	100	12	80	49	15	57	37	58	51	59	.20	−.4	4	5,054	nw.	17	nw.	13	16	11	4	3.7	.0	.0
Roseburg	510	45	76	29.44	29.98	−.02	69.6	+1.6	106	12	86	44	16	53	51	57	48	54	.36	.0	3	3,838	n.	16	ne.	15	23	8	0	2.0	.0	.0
Middle Pacific Coast Region							63.9	+1.3										60	0.08	0.0										2.8		
Eureka	62	73	89	29.92	29.99	−.01	55.4	−.6	67	27	60	44	16	51	15	53	51	88	T	−.2	0	4,934	n.	21	nw.	14	11	10	10	5.1	.0	.0
Redding	722	20	34	------	------	------	82.9	------	111	12	97	60	6	69	36	59	39	25	T	------	0	5,734	nw.	20	n.	1	28	2	1	.9	.0	.0
Sacramento	66	92	115	29.75	29.82	−.03	76.4	+3.5	109	11	93	53	4	60	43	60	49	46	T	.0	0	5,465	s.	20	s.	14	29	2	0	.6	.0	.0
San Francisco	155	208	243	29.72	29.89	−.03	60.0	+.9	85	11	67	50	9	53	28	54	52	81	.25	+.2	1	5,779	sw.	27	nw.	5	13	12	6	4.4	.0	.0
South Pacific Coast Region							75.5	+2.0										63	0.10	+0.1										3.5		
Fresno	327	97	105	29.46	29.80	−.02	82.2	+1.5	107	12	98	58	16	66	39	62	47	36	T	.0	0	4,919	nw.	16	nw.	27	26	4	1	1.3	.0	.0
Los Angeles	338	159	191	29.51	29.86	−.02	74.0	+2.9	98	9	83	57	6	65	30	64	59	69	.11	+.1	2	4,143	sw.	15	sw.	9	16	9	6	3.6	.0	.0
San Diego	87	62	70	29.77	29.86	−.03	70.4	+1.7	86	9	76	61	3	65	18	65	63	83	.18	+.1	1	4,880	nw.	18	nw.	21	10	10	11	5.5	.0	.0
West Indies																																
San Juan, P. R	82	9	54	29.87	29.95	------	80.4	−.1	89	1	85	72	7	76	14	----	----	----	5.12	−.9	20	8,550	e.	33	e.	24	3	22	6	5.8	.0	.0
Panama Canal																																
Balboa Heights	118	6	97	------	[2]29.84	------	78.9	−2.3	89	30	84	71	14	73	16	----	----	88	11.41	−3.5	24	3,544	nw.	22	s.	3	0	10	21	7.9	.0	.0
Cristobal	36	6	97	------	[2]39.85	------	80.8	−6.9	91	29	86	71	8	75	16	75	74	84	14.72	−.5	23	4,372	se.	22	ne.	7	0	13	18	7.8	.0	.0
Alaska																																
Fairbanks	454	11	87	[2]29.39	[2]29.90	------	50.2	------	73	27	60	31	22	40	35	46	41	73	2.01	+.1	14	4,610	s.	22	sw.	3	5	7	19	7.2	.0	.0
Juneau	80	96	116	[2]29.91	[2]30.00	------	53.7	------	72	14	59	43	15	48	27	50	47	80	10.40	------	21	4,177	s.	25	se.	10	5	3	23	7.9	.0	.0
Hawaiian Islands																																
Honolulu	38	86	100	[2]29.97	[2]30.01	------	78.4	.0	85	18	83	71	10	74	12	70	69	68	.85	−.4	11	6,945	e.	25	e.	19	17	14	0	3.2	.0	.0

[1] Observations taken at airport.

[2] Observations taken hourly.

[3] Pressure not reduced to mean of 24 hours.

TABLE 2.—*Data furnished by the Canadian Meteorological Service, August 1935*

Stations	Altitude above mean sea level, Jan. 1, 1919	Pressure			Temperature of the air						Precipitation		
		Station reduced to mean of 24 hours	Sea level reduced to mean of 24 hours	Departure from normal	Mean max. + mean min. ÷2	Departure from normal	Mean maximum	Mean minimum	Highest	Lowest	Total	Departure from normal	Total snowfall
	Feet	*In.*	*In.*	*In.*	*°F.*	*°F.*	*°F.*	*°F.*	*°F.*	*°F.*	*In.*	*In.*	*In.*
Cape Race, Newfoundland	99												
Sydney, Cape Breton Island	48												
Halifax, Nova Scotia	88												
Yarmouth, Nova Scotia	65												
Charlottetown, Prince Edward Island	38												
Chatham, New Brunswick	28												
Father Point, Quebec	20	29.88	29.90	−0.01	59.0	+2.4	68.0	49.9	84	44	2.08	−0.97	0.0
Quebec, Quebec	296	29.66	29.98	+.05	66.6	+3.5	74.1	59.0	88	48	8.07	+4.24	.0
Doucet, Quebec	1,236				59.7		73.1	46.3	92	28	1.88		.0
Montreal, Quebec	187	29.79	29.99	+.04	69.2	+2.8	77.0	61.3	89	50	4.02	+.45	.0
Ottawa, Ontario	236	29.72	29.98	+.02	66.6	+1.8	78.9	54.3	92	38	1.20	−1.83	.0
Kingston, Ontario	285	29.69	29.99	+.01	69.3	+2.3	76.5	62.2	88	46	.81	−1.57	.0
Toronto, Ontario	379	29.60	29.99	.00	69.9	+3.9	79.0	60.8	89	46	.45	−2.31	.0
Cochrane, Ontario	930				62.7		72.9	52.5	90	36	2.37		.0
White River, Ontario	1,244	28.66	29.95	−.01	60.2	+3.8	71.5	49.0	85	31	2.76	−.54	.0
London, Ontario	808				67.0		76.0	58.0	87	40	3.47		.0
Southampton, Ontario	656	29.29	30.00	+.01	67.2	+3.4	76.9	57.5	93	41	2.16	−.09	.0
Parry Sound, Ontario	688	29.30	29.98	.00	68.5	+5.0	78.0	59.1	94	45	1.00	−1.72	.0
Port Arthur, Ontario	644	29.28	29.98	+.02	63.3	+3.8	71.0	55.6	88	36	3.44	+.69	.0
Winnipeg, Manitoba	760	29.08	29.90	−.04	63.6	+.2	74.3	52.9	95	34	4.75	+2.08	.0
Minnedosa, Manitoba	1,690	28.13	29.92	−.02	59.3	−.1	70.0	48.6	90	33	3.04	+.94	.0
Le Pas, Manitoba	860		29.91		59.2		69.8	48.6	85	34	2.02		.0
Qu'Appelle, Saskatchewan	2,115	27.67	29.89	−.04	59.6	−1.9	71.8	47.5	91	30	3.56	+1.92	.0
Moose Jaw, Saskatchewan	1,759				61.1		73.9	48.3	94	34	3.10		.0
Swift Current, Saskatchewan	2,392	27.39	29.87	−.06	60.7	−3.3	75.3	46.1	98	29	1.88	−.03	.0
Medicine Hat, Alberta	2,365	27.46	29.91	−.01	64.3	−1.4	78.1	50.6	98	37	.47	−1.20	.0
Calgary, Alberta	3,540	26.33	29.97	+.06	56.2	−3.2	68.8	43.7	85	33	1.92	−.22	.0
Banff, Alberta	4,521												
Prince Albert, Saskatchewan	1,450	28.38	29.94	+.02	59.4	+.5	70.8	48.1	88	34	2.68	+.53	.0
Battleford, Saskatchewan	1,592	28.19	29.91	.00	60.6	−2.0	73.8	47.4	89	30	2.06	−.30	.0
Edmonton, Alberta	2,150												
Kamloops, British Columbia	1,262												
Victoria, British Columbia	230	29.78	30.03	+.02	60.2	+1.5	68.4	52.0	88	48	.53	−.07	.0
Barkerville, British Columbia	4,180												
Estevan Point, British Columbia	20												
Prince Rupert, British Columbia	170												
Hamilton, Bermuda	151	29.91	30.07	−.03	79.1	−.5	84.1	74.1	87	70	11.63	+5.55	.0
LATE REPORTS FOR JULY 1935													
Cape Race, Newfoundland	99				53.6		60.3	47.0	69	40	2.88		0.0
Sydney, Cape Breton Island	48	29.91	29.96	+0.03	65.9	+3.6	76.9	54.9	89	42	3.05	−0.60	.0
Halifax, Nova Scotia	88	29.76	29.86	−.10	65.7	+2.3	73.8	57.7	83	51	1.67	−2.38	.0
Yarmouth, Nova Scotia	65	29.88	29.95	.00	62.7	+3.2	70.5	54.9	82	47	3.20	−.27	.0
Charlottetown, Prince Edward Island	38	29.87	29.91	+.01	66.7	+2.6	75.3	58.1	84	50	1.79	−1.70	.0
Chatham, New Brunswick	28	29.81	29.84	−.04	67.4	+2.4	78.8	56.0	88	43	2.65	−1.54	.0
Montreal, Quebec	187	29.75	29.95	+.02	72.4	+3.9	80.6	64.2	89	56	5.58	+1.29	.0
Ottawa, Ontario	236	29.68	29.94	.00	70.7	+1.2	81.2	60.2	90	46	3.28	−.19	.0
Kingston, Ontario	285	29.64	29.94	−.03	71.6	+3.4	78.6	64.7	90	57	7.58	+4.69	.0
Cochrane, Ontario	930				66.5		77.6	55.5	91	39	4.51		.0
White River, Ontario	1,244												
London, Ontario	808				71.8		82.5	61.1	93	52	3.93		.0
Qu'Appelle, Saskatchewan	2,115	27.67	29.87	−.05	67.4	+3.9	80.3	54.6	94	48	2.38	−.10	.0
Moose Jaw, Saskatchewan	1,759				70.4		83.3	57.5	95	51	2.54		.0
Swift Current, Saskatchewan	2,392	27.40	29.86	−.05	68.4	+1.9	82.9	53.9	98	44	3.40	+.96	.0
Prince Albert, Saskatchewan	1,450	28.36	29.90	−.01	68.8	+6.9	80.0	57.7	92	52	2.15	+.10	.0
Battleford, Saskatchewan	1,592	28.18	29.89	−.01	67.8	+3.1	82.2	53.4	96	42	1.76	−.58	.0
Kamloops, British Columbia	1,262	28.65	29.91	−.03	69.0	+.5	82.1	56.0	104	44	1.45	−.16	.0
Victoria, British Columbia	230	29.79	30.04	−.01	59.5	−.5	66.7	52.3	90	48	.95	+.55	.0
Estevan Point, British Columbia	20				56.2		61.6	50.9	68	45	2.24		.0
Prince Rupert, British Columbia	170				56.1		62.1	50.1	75	42	2.81		.0

SEVERE LOCAL STORMS, AUGUST 1935

[Compiled by Mary O. Souder, from reports by Weather Bureau officials]

[The table herewith contains such data as have been received concerning severe local storms that occurred during the month. A revised list of tornadoes will appear in the Annual Report of the Chief of Bureau]

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Green, Ind	1	4 p. m.	[1] 2½		$15,000	Thundersquall	Property damage $5,000; crop damage $10,000; path 4 miles long.
Williamsport Pa	1	5 p. m.			10,000	Heavy electrical	Many large trees uprooted, 1 crashing through an automobile top; many electric poles blown down with resultant delay to communication lines.
Oreland, Pa	1	7:15 p. m.	100	0	5,000	Small tornado	Damage mostly to small buildings; loss to crops; path very short.
Red Cloud, Nebr	1	8:30–9 p. m	800	0	5,000	Tornado	2 persons injured; property damaged.
Genesee to Schuyler Counties, N. Y.	1				500,000	Hail and wind	Hail damage to fruits, grains, beans and other crops amounted to thousands of dollars; winds wrecked barns and silos, damaged property; uprooted trees and tore down telephone lines in scattered localities; in the vicinity of Hector, N. Y., alone, damage to fruits and other crops estimated to be $500,000.
Lebanon, near, S. Dak	1	6 p. m.	[1] 3		40,000	Wind	Damage to buildings and farming implements; loss to crops; path 10 miles long.
Miami and Claypool, Ariz	1				3,000	Heavy rain	Sections of the road washed; highway traffic delayed.
Miller, near, S. Dak	1	8 p. m.	[1] 6		100,000	Hail	Damage to roofs, cars, farming implements and windows; loss to crops, poultry and livestock; path 25 miles long.
Norwood, N. Y	1				5,000	Electrical	4 barns burned after being struck by lightning.
Peru, N. Y	1				50,000	Heavy hail	Loss to crops, especially to apples.
Potsdam, near, N. Y	1			1		Electrical	1 person killed by lightning.
Richland, Iowa	1				3,700	Wind and rain	Cornfields flattened; buildings damaged.
Le Sueur, Minn	1–2				6,000	Heavy rain	Railroad tracks washed out; much corn lodged; considerable damage to grain in shocks; 7.34 inches of rain fell in 3½ hours.
Carroll-Wayne, Nebr	2	3 p. m.	[1] 2		30,000	Hail and wind	Property damaged.
Galesburg-Knoxville, Ill	2				10,000	Wind	Property damage, $10,000; corn blown down; wheat and oat shocks scattered; loss to grain not estimated.
Monroe, Wis	2				5,000	do	Loss to grain and corn; on 1 farm the barn was destroyed and silos, sheds, and machinery damaged.
Clinton, Iowa	3					Thunderstorm, heavy rain.	Basements flooded, foundations undermined and traffic delayed.
Peru and Ausable Chasm, N. Y.	4	5:30 p. m.			250,000	Heavy hail	Loss to crops; $100,000 to apples alone; roofs and windows damaged.
Falls, Pa., and vicinity	4	P. m.			5,000	Electrical	Trees uprooted; communication lines damaged; porches of several small cottages unroofed.
Norwood, Minn., and vicinity	5	4:22 p.m.	440	0	30,000	Small tornado	Several barns and outbuildings wrecked; roof of large town garage lifted; residences damaged; trees uprooted; loss to crops; path 7 miles long.
Merton, Minn., and vicinity	5	P. m.				Hail	Considerable damage to growing crops.
Richland, Minn	5	do		0		Small tornado	Several farm houses and buildings wrecked or damaged; poles down; trees uprooted and loss to crops.
Minnesota, extreme southeastern portion.	5	do			150,000	Rain and flood	Long stretches of railroad track, bridges and dams washed out; highways damaged; creosote block pavements buckled; basements flooded; many acres of farm land under water; much crop loss; considerable property damage; rail and highway traffic seriously delayed.
Cumberland and Rice Lake, Wis., vicinity of.	5				20,000	Wind and rain	Several barns and silos destroyed and other buildings damaged.
Walworth and Edmunds Counties, S. Dak.	6	5:45 p. m.			9,000	Hail	Windows broken; roofs wrecked; poultry killed; gardens damaged; loss to property $1,500 and to crops, $8,000.
La Crosse, Monroe, Vernon, Sauk, Dane, and Buffalo Counties, Wis.	6			1	300,000	Heavy rain and flood.	Dams broke; several buildings swept away; highways and railroads washed out; at least 14 bridges carried off their foundations or wrecked; tangible property loss $300,000 and loss of prospective crops nearly as much more.
Beadle County, S. Dak	7	5:20–5:45 p. m.	[1] 7		5,500	Wind	Damage to houses and outbuildings; path 8 miles long.
Clark County, S. Dak	7	5:45 p. m.			1,000	do	Garage wrecked; loss in shocked grain.
Humboldt-Sioux Falls, S. Dak	7	9–9:30 p. m		2		Wind, rain and hail.	Heaviest hail damage from Humboldt to Hartford and 4 to 5 miles south; corn stripped of leaves; windows broken; roofs riddled; washouts due to heavy rain in Sioux Falls flooded streets and basements; 2 men pinned underneath a truck, when it overturned, and killed.
Galloway, Ohio	8	4:30 p. m.	220	0	5,000	Tornado	Buildings damaged; trees uprooted; cornfields flattened.
Bagley, Iowa, 3 miles south	8			0		do	Buildings destroyed and trees blown down; amount of damage not estimated.
Midland, Iowa	8					Thunderstorm, heavy rain and hail.	Lightning struck trees and fences; estimated losses to shocked grains and corn from 50 to 90 percent.
Ville Platte, La	9	5–5:15 p. m	[1] 2		3,000	Wind	Several houses unroofed; trees uprooted; crops damaged; path 4 miles long.
Clarke, La	10	2:30 p. m.			3,000	do	Damage principally to a lumber mill, where a man was injured by flying glass; houses unroofed; smokestack blown down.
Havre, Mont	10	3:30–12 p.m				Gale	Considerable dust hurled into the air, thickest from 6:30 to 8 p. m., when the visibility was only 2 miles.
Glasgow, Mont	10	4–7 p. m.	[1] 20		5,000	Wind	Damage to property and communication lines.
Faith, S. Dak., vicinity of	10	P. m.	[1] 2		500	do	Mowed hay and some stacks scattered.
Palestine, Tex. 4 miles west	10			0	100	Tornado	A meat house and a poultry house blown down.
Daniels County, Mont	11				100,000	Hail	Loss to crops; no other property damage mentioned; storm particularly severe.
Cherokee County, Kans	12	3:30–4 p. m	[1] 20		50,000	Wind	Chief damage to power and telephone lines and to property; path 40 miles long, extending into Missouri.
Rockville, Ind., near	12				1,200	Electrical	Barn and contents destroyed.
Jasper and Barton Counties, Mo.	12				13,000	Wind and rain	Considerable damage to trees, outbuildings, and communication lines; loss to crops.
Springfield, Mo., and vicinity	12				50,000	Thundersquall, hail and heavy rain.	Much damage to telephone and electric lines throughout the city; roofs damaged by hail; numerous trees uprooted and limbs torn off and carried quite a distance; a near-tornado reported at 3:30 p. m., tearing down trees, blocking the highway with debris.
Chautauqua County, N. Y	12				17,500	Thundersquall	Power and light lines blown down; 2 barns burned by lightning; loss to peach and apple crops; trees blown down blocking highways.
Dayton, Ohio, vicinity of	13	A. m.				do	Wind, making a curved path through a grove of large trees, blew down 21 and damaged many others; velocity of 46 miles per hour recorded at Dayton; 0.86 inch of rainfall between 3:15 and 3:50 a. m.; storm covered a large area.
Goodlettsville, Tenn	13				6,000	do	Lightning damaged a house and packing plant; damage to trees, wires, and roofs.
Trenton, N. J	15	3:50–5:35 p. m.				Thunderstorm	Considerable damage reported.
Cumberland and Dauphin Counties, Pa.	15	P. m.			25,000	Electrical	Series of violent electric storms in early evening; 4 barns and several dwellings struck by lightning; 1 person injured by falling tree.
Scranton, Pa., and vicinity	16					Severe electrical, excessive rain and heavy hail.	15 places struck by lightning; streets and cellars flooded.

[1] Miles instead of yards.

SEVERE LOCAL STORMS, AUGUST 1935—Continued

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Baldwin, Kans., miles northwest.	17	11:30 a. m.-12:30 p. m.	[1] 2			Wind	Trees uprooted; crops damaged; farm implements overturned; path 2 miles long; amount of damage not estimated.
Wakefield, Nebr	17	6-7:30 p. m.	[1] 1		$5,000	Wind and hail	Property damaged.
Marshall, Mo., and vicinity	17					Excessive rain	4.35 inches of rain fell, mostly within 2 hours; streets, basements, and lowlands flooded; livestock drowned; loss to crops; bridges damaged.
Cuming County, Nebr., northeastern section.	17		[1] 2		25,000	Hail	Property damaged.
Big Stone County, Minn., southern portion.	17-18					Heavy rain	Many basements and highways flooded; considerable damage reported.
Dubuque, Iowa, and vicinity	19	A. m.				Thunderstorm	Barn struck by lightning and destroyed; in another section 6 cattle killed by lightning.
Lexington, S. C., and vicinity.	19	3:30 p. m.			37,500	Heavy rain and flood.	Martel Mill Dam at Lexington gave way, causing $25,000 damage; tourist camp, consisting of cabins, filling station, and cafeteria, and 3 residences, destroyed with $12,000 loss; $300 crop loss along the flooded creek over a path 50 yards wide and 6 miles long.
Hillsboro, Wis	19				10,000	do	Heavy rains in Sauk County during the 18th and 19th caused the Baraboo River to overflow at Hillsboro about 8 a. m. of the 19th; property damaged.
Elrosa, Minn., and vicinity	19-20				40,000	Electrical, wind and rain.	15 farm buildings destroyed; church damaged.
Stearns County, Minn., southern portion.	19-20				72,500	Electrical and heavy rain.	Basements and lake cottages flooded; railroad tracks washed out; highways damaged; corn badly lodged.
La Bajada Hill, N. Mex	20	10 p. m.		4	25,000	Cloudburst	Excessive rain washed out a stretch of the highway and an automobile drove into a ditch that was 75 feet wide and 35 feet deep, causing the death of 4 persons.
Littleton, Sedalia, Watertown and Kassler, Colo., vicinity of.	20	P. m.			50,000	Torrential rains	Train and automobile traffic interrupted; many farms inundated.
Philip-Presho, S. Dak., vicinity of.	21	3:30-8 p. m.			4,500	Wind and rain	Buildings damaged; loss to crops.
Arthur, Nebr	21	6:30 p. m.	[1] 2		3,000	Hail	Property damaged.
Providence, R. I., and vicinity	22					Thunderstorm	In Providence lightning struck a church tower, hurling 1 of the small turrets from the top of the tower to the street; house and barn in eastern section of the city struck by lightning and damaged; several washouts occurred in Warwick, East Providence, and Warren; in Portsmouth lightning struck and destroyed a large barn containing 120 tons of hay, a prize bull dying in the blaze; in Warren the tower of the town hall was struck by lightning.
Wickenburg, Ariz	22-23				10,000	Heavy rain and flood.	Torrents of water poured through the Wickenburg area, damaging several houses along the Hassayampa River, cutting away portions of the highway and railway, and damaging bridges so that all travel was delayed more than 24 hours.
Cambria, Wis., 20 miles southwest.	26			1	5,000	Wind	Boy killed when a barn collapsed, 5 others injured; property damaged.
Spartanburg County, S. C	26				4,275	Heavy rain	Bridges and roads damaged.
Grand Rapids, Mich	27	6:44 p. m.				Line squall	Trees blown down; power lines snapped, and windows shattered.
Holly, near, Colo	28	A. m.				Heavy rain	High waters destroyed an earthen flood control dam; basements flooded; several barns inundated; livestock lost.
Wild Horse and Kit Carson, Colo.	28					do	Railroad tracks washed out, delaying trains.
Willcox, near, Ariz	28			5		do	A transcontinental bus was hit by a wall of water at the Dragoon underpass, near Willcox, with a loss of 5 lives.
Dodge, Nebr	29		[1] 1	0	7,000	Tornado	Property damaged.
Dona Ana County, N. Mex	29-30	P. m.			806,150	Excessive rain	In the vicinity of Las Cruces, 6.46 inches of rain fell in 9 hours causing $205,000 property loss; rural losses in Dona Ana County as a direct result of the storm and from overflow of the Rio Grande occasioned by the storm amounted to $806,150, divided as follows: property $71,050; crops, matured and prospective, $687,700; canals, roads, and land levels, $45,600; livestock, $1,800; from the State line to El Paso, Tex., the loss was estimated at $350,000.
Carbon County, Mont	31	4 p. m.			75,000	Hail	$50,000 crop loss; $25,000 damage to buildings; cars and livestock loss.
Livingston, Mont	31	P. m.	[1] 8		2,000	Hail and heavy rain.	Flooding caused by breaking of dams resulted in several thousand dollars' damage to property and loss to crops; $2,000 damage from hail; not possible to estimate damage from flooding.
Tucson-Nogales, Ariz	31				30,000	Flood	Property damaged at Helvetia and other localities between Tucson and Nogales.

[1] Miles instead of yards.

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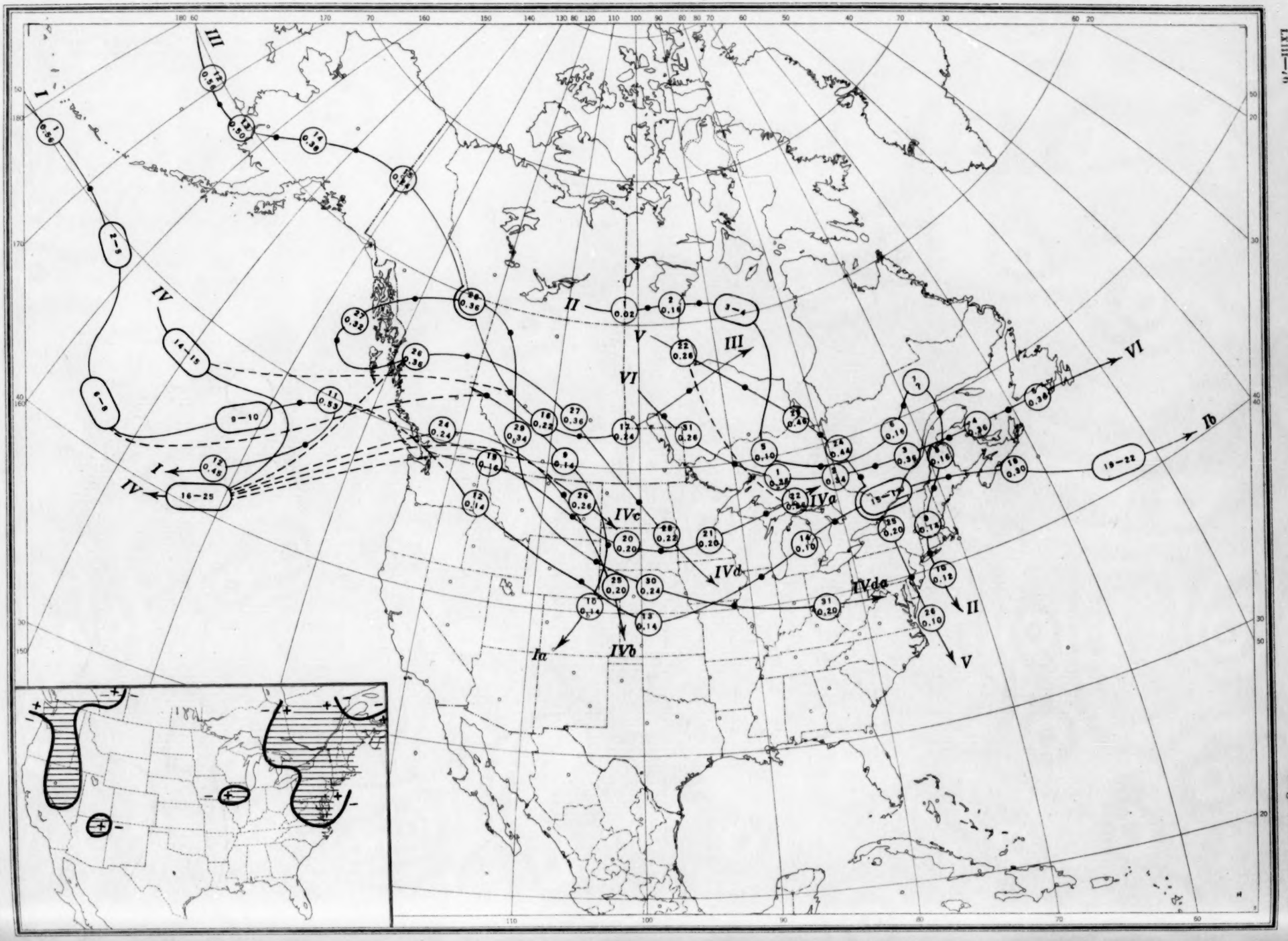
Chart I.—Departure (°F.) of the Mean Temperature from the Normal, August 1936

Chart I. Departure (°F.) of the Mean Temperature from the Normal, August 1935

Chart II. Tracks of Centers of Anticyclones, August 1935. (Inset) Departure of Monthly Mean Pressure from Normal

(Plotted by W. P. Day)



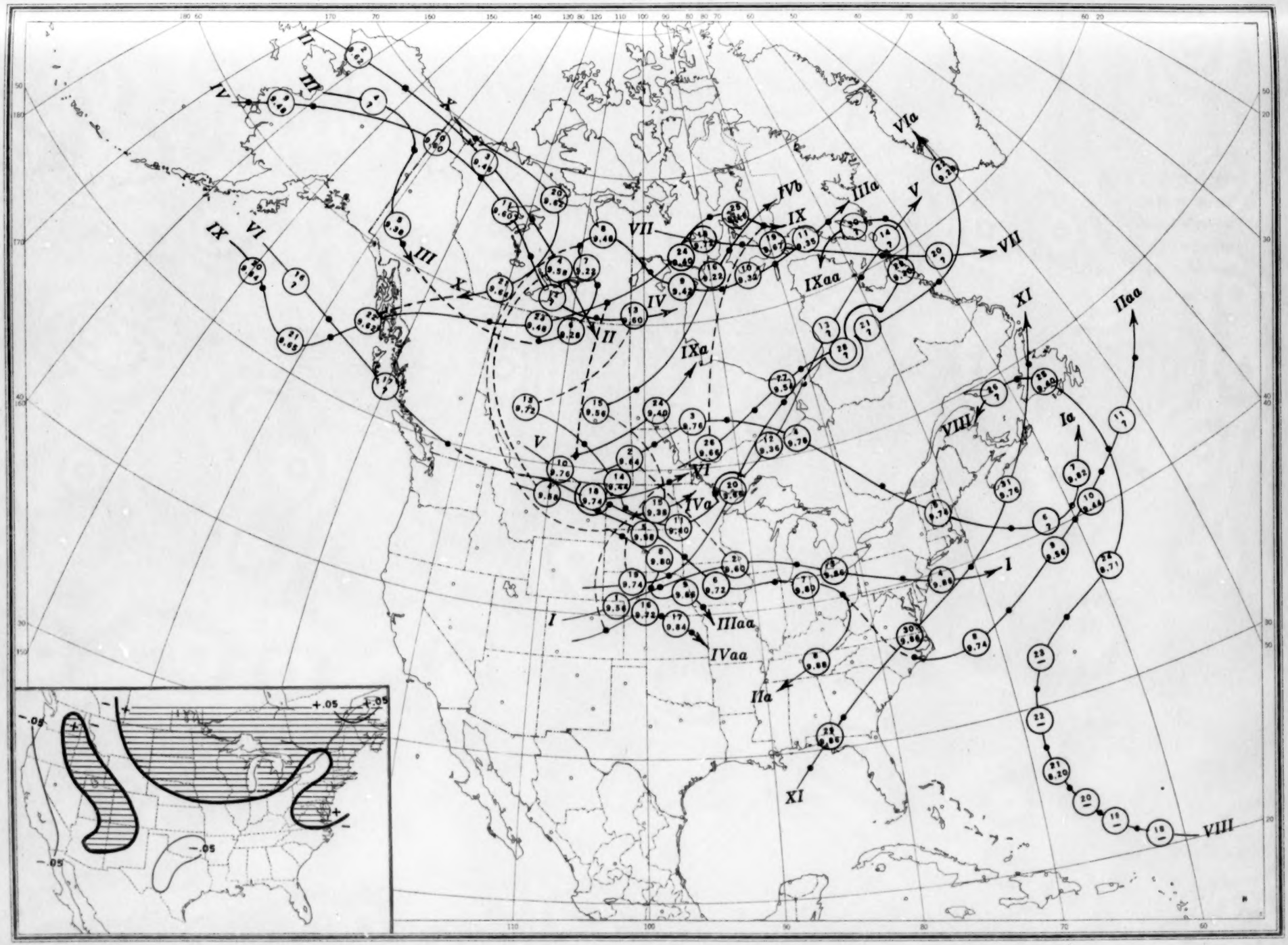
Circle indicates position of anticyclone at 8 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 8 p. m. (75th meridian time).

Chart III. Tracks of Centers of Cyclones, August 1935. (Inset) Change in Mean Pressure from Preceding Month

Circle indicates position of anticyclone at 8 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 8 p. m. (75th meridian time).

Chart III. Tracks of Centers of Cyclones, August 1935. (Inset) Change in Mean Pressure from Preceding Month

(Plotted by W. P. Day)



Circle indicates position of cyclone at 8 a. m. (75th meridian time), with barometric reading. Dot indicates position of cyclone at 8 p. m. (75th meridian time).

Chart IV. Percentage of Clear Sky Between Sunrise and Sunset, August 1935

Chart V. Total Precipitation, Inches, August 1935 (Inset) Departure of Precipitation from Normal

Chart V. Total Precipitation, Inches, August 1935. (Inset) Departure of Precipitation from Normal

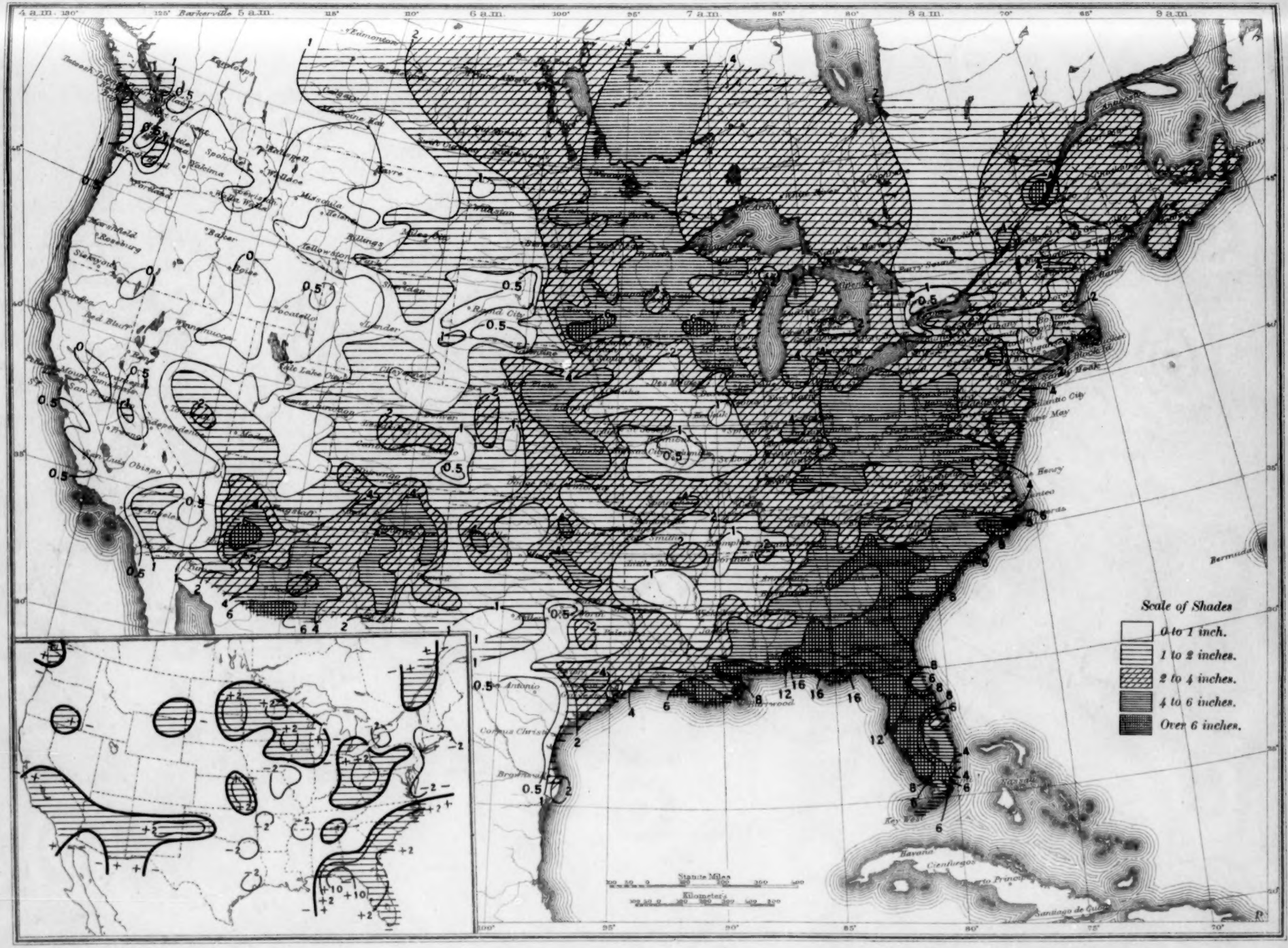


Chart VI. Isobars at Sea Level and Isotherms at Surface; Prevailing Winds, August 1935

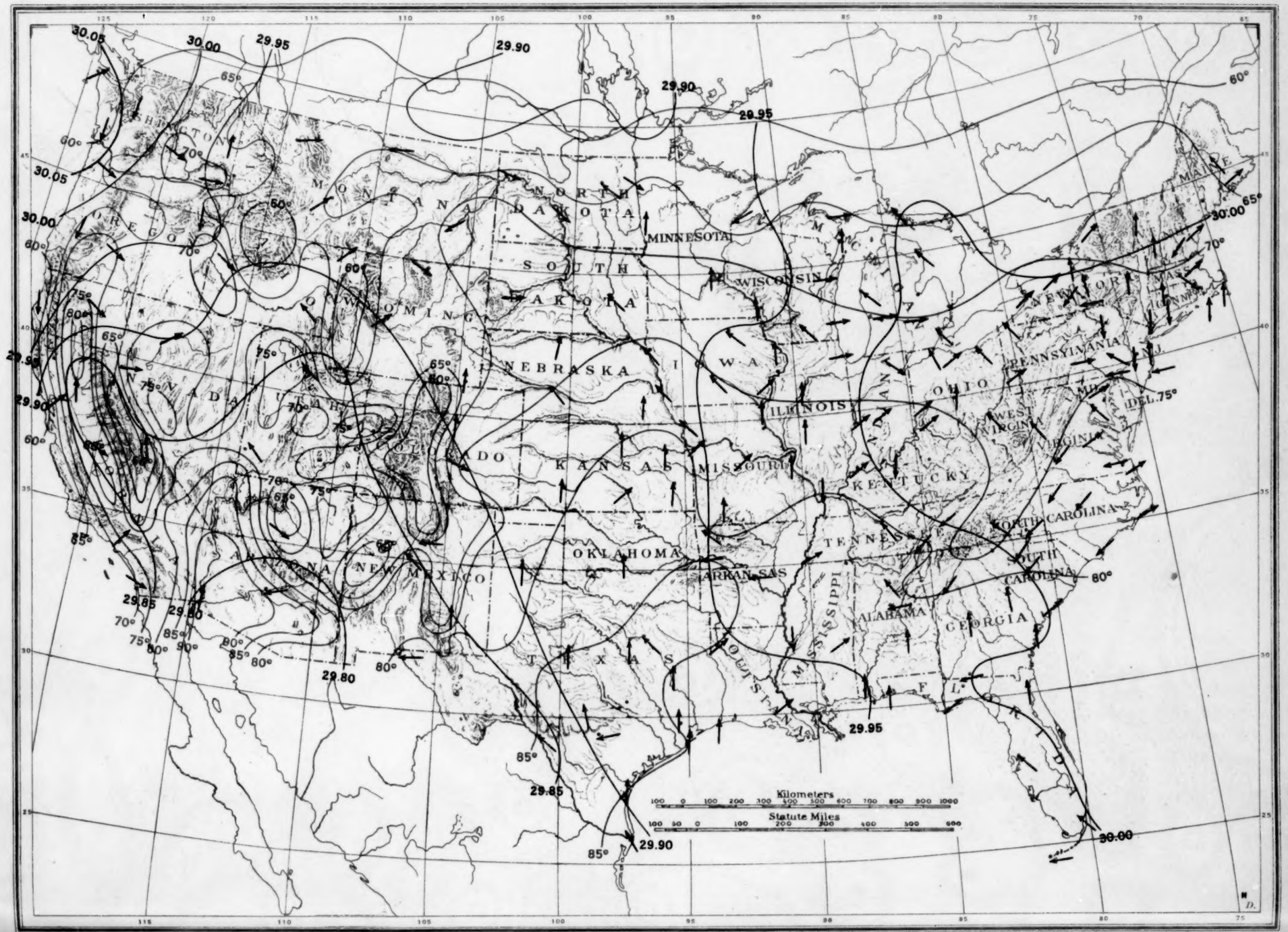


Chart VII. Wind Roses for Selected Stations, August 1935

Chart VII. Wind Roses for Selected Stations, August 1935

(Plotted by E. Corbin)

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Chart IX. Weather Map of North Atlantic Ocean, August 18, 1935

Chart IX. Weather Map of North Atlantic Ocean, August 18, 1935

(Plotted from the Weather Bureau Northern Hemisphere Chart)

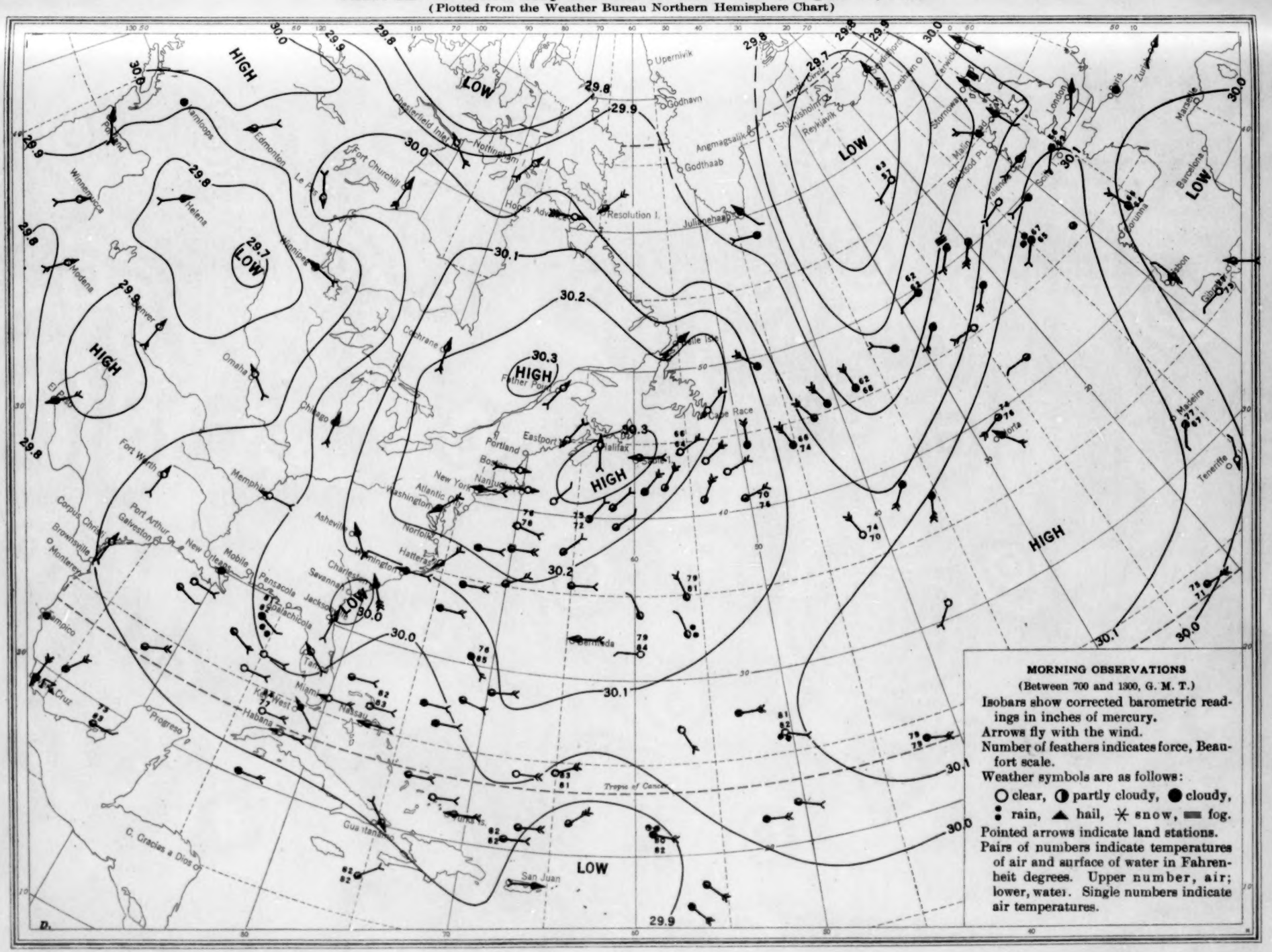
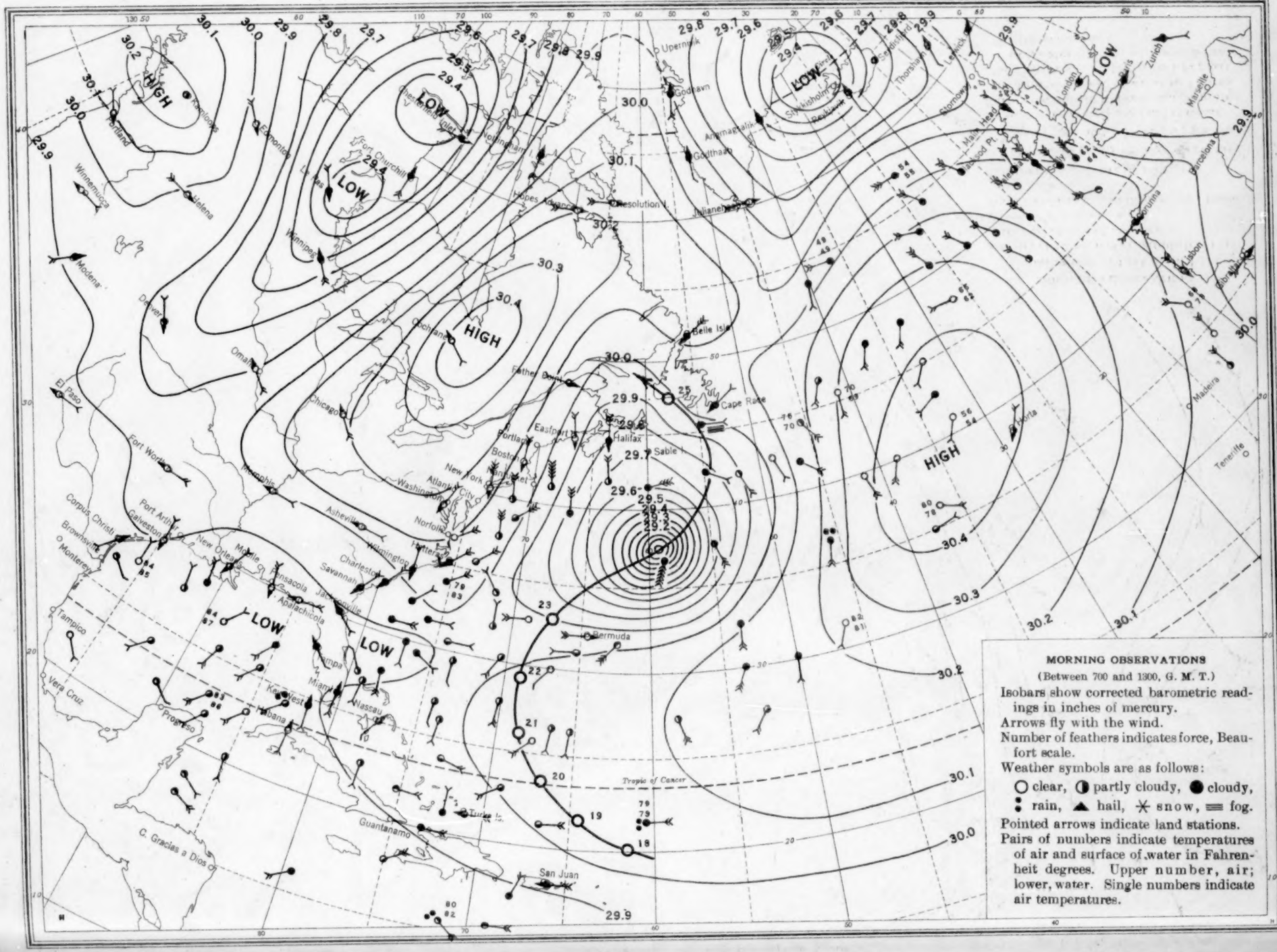


Chart X. Weather Map of North Atlantic Ocean, August 24, 1935

(Plotted from the Weather Bureau Northern Hemisphere Chart)



MORNING OBSERVATIONS

(Between 700 and 1300, G. M. T.)

Isobars show corrected barometric readings in inches of mercury.

Arrows fly with the wind.

Number of feathers indicates force, Beaufort scale.

Weather symbols are as follows:

○ clear, ◑ partly cloudy, ● cloudy, ⁝ rain, ▲ hail, ✳ snow, 〓 fog.

Pointed arrows indicate land stations.

Pairs of numbers indicate temperatures of air and surface of water in Fahrenheit degrees. Upper number, air; lower, water. Single numbers indicate air temperatures.